



22-204

Cimarron Elementary School HVAC Upgrades and Replacement

Issue Date: 7/18/2022

Questions Deadline: 8/2/2022 07:50 AM (CT)

Response Deadline: 8/9/2022 02:00 PM (CT)

Purchasing

Contact Information

Address: Capital & Bond Projects
Administration Building
Galena Park ISD
14705 Woodforest Blvd.
Houston, TX 77015

Phone: (832) 386-1259

Email: capitalprojects@galenaparkisd.com

Event Information

Number: 22-204
Title: Cimarron Elementary School HVAC Upgrades and Replacement
Type: Competitive Sealed Proposal
Issue Date: 7/18/2022
Question Deadline: 8/2/2022 07:50 AM (CT)
Response Deadline: 8/9/2022 02:00 PM (CT)
Notes: Galena Park Independent School District (GPISD) is requesting **Competitive Sealed Proposals (CSP #22-204)** for **Cimarron Elementary School HVAC Upgrades and Replacement (Project #E130)**. Proposals are due on Tuesday, August 9, 2022 at 2:00 pm . GPISD prefers responses to be submitted online via our electronic system. Submissions may be submitted manually, manual submissions must be delivered to the Capital Projects Department in the GPISD Administration Building, 14705 Woodforest Blvd., Houston, TX 77015, in a sealed envelope by the close date and time stated in this bid event. Proposals will be opened publicly and read aloud following the close of the bid at the GPISD Administration building. A Proposal Security in the amount of five percent (5%) of the proposal amount is required. Additional information may be obtained at GPISD eBid system <https://galenaparkisd.ionwave.net/Login.aspx> or by contacting the Capital Projects Department at capitalprojects@galenaparkisd.com.

The scope of work includes **HVAC Upgrades and Boiler Replacement**.

A pre-proposal conference will be held at the **GPISD Administration Building**, on August 1, 2022 at 9:00 am . Attendance is highly recommended.

Contract Documents will be available on July 18, 2022 on the district eBid system <https://galenaparkisd.ionwave.net/Login.aspx>. Proposers may also obtain additional documents, at their cost, from ABC Imaging, 4902 Richmond Avenue, Suite C, Houston, TX 77027.

GPISD reserves the right to reject any and all proposals, the right to negotiate with any proposers after submission of proposals, and at its discretion, may waive any formalities or minor irregularities regarding the proposals.

Ship To Information

Address: Capital & Bond Projects
Administration Building
Galena Park ISD
14705 Woodforest Blvd.
Houston, TX 77015
Phone: (832) 386-1259
Email: capitalprojects@galenaparkisd.com

Billing Information

Address Accounts Payable
:
Galena Park ISD
14705 Woodforest Blvd.
Houston, TX 77015
Phone: (832) 386-1025
Fax: (832) 386-1428
Email: accounts_payable@galenaparkisd.com

Bid Activities

Advertisement 1	7/17/2022
Advertisement 2	7/24/2022
Pre Proposal Conference Meet at Cimarron Elementary 816 Cimarron St Houston, TX 77015	8/1/2022
Pre-Qualifications Due	8/4/2022
Prepare & Forward Contract to GC	9/5/2022
Contractor execute & return contract	9/9/2022
Board of Trustee Meeting	9/12/2022
Contractor obtain bonds & Insurance	9/19/2022
Issue Notice to Proceed	9/26/2022
Substantial Completion	12/2/2022

Bid Attachments

W9.pdf W9	Download
Conflict of Interest Form.pdf Conflict of Interest Form	View Online
Conflict of Interest Sample.pdf Conflict of Interest Sample	View Online
Form 1295 Instructions.pdf Form 1295 Instructions	View Online
Form 1295 Sample 2021.pdf Form 1295 Sample 2021	View Online
Texas and Federal Certifications.pdf Texas and Federal Certifications	View Online
Certification of Criminal History Record.pdf Certification of Criminal History Record	View Online
US Wage and Hour Division Certified Payroll Form.pdf US Wage and Hour Division Certified Payroll Form	View Online
Davis Bacon Act.pdf Davis Bacon Act	View Online
Contract Documents - Federal Funds.pdf Contract Documents - Federal Funds	View Online
Specifications - CSP 22-204 CIM HVAC.pdf Specifications - CSP 22-204 CIM HVAC	View Online

Requested Attachments

Proposal Bond

(Attachment required)

See PROPOSAL BOND FOR BUILDING CONSTRUCTION CONTRACTS Attribute for additional information

Conflict of Interest Form

(Attachment required)

Please download the Conflict of Interest form from the "Attachment" tab, complete and upload your signed document here.

Texas and Federal Certifications

(Attachment required)

Please download the Texas and Federal Certifications Forms from the Attachments tab, complete, and upload your signed document here.

Form 1295

(Attachment required)

Please follow the Form 1295 instructions, complete and upload your signed document here.

Certification of Criminal History Record

(Attachment required)

Please download the Certification of Criminal History Record Forms from the "Attachments" tab, complete and upload your signed document here.

W9

(Attachment required)

Please download the W9 form from the "Attachment" tab, complete and upload your signed document here.

AIA A305 Qualification Statement

(Attachment required)

See the PROPOSAL PHASE PROCEDURES for additional information.

References

(Attachment required)

See PROPOSAL PHASE PROCEDURES Part 2.1 PROPOSER QUALIFICATION STATEMENTS for details on Reference requirements.

Contractor's Proposed Project Personnel

(Attachment required)

Submit a complete resume and other supportive information of each person listed in the Contractor's Proposed Project Personnel attribute.

Proposed schedule

(Attachment required)

Attach your proposed project schedule

Davis Bacon Act

(Attachment required)

Please download the Davis Bacon Act Forms from the Attachments tab, complete, and upload your signed document here.

Bid Attributes

1 Introduction

There are attributes, including this one, associated with this proposal. Some are notes and require no response, but most have a required response. ****Please select each page on the right-hand side of the blue bar below (at the bottom of this list of attributes) in order to view the next page of Bid Attributes****

2 Submission Response

The district recommends proposers submit their response to this RFP using the GPISD eBid System. The forms listed in the "Response Attachments" tab must be completed, signed, scanned, and attached, the forms/instructions can be found under the "Attachments" tab. Please ensure that you respond to all Bid Attributes and Line Items.

Galena Park ISD prefers responses to be submitted online via our electronic system. Submissions may be submitted manually. Manual submissions must be delivered to the Capital Projects Department, in a sealed envelope by the close date and time stated in this bid event. No fax or email submissions will be accepted. Only one format is needed. Manual submission shall consist of one (1) original hard copy and one (1) electronic flash drive. For any questions, please contact the Capital Projects Department at capitalprojects@galenaparkisd.com.

3 Communications Statement

Contact between vendors and Galena Park ISD personnel during the proposal process or evaluation process is prohibited. Any attempt by vendors during the proposal process to contact district personnel may result in disqualification. All communication shall go through the Capital Projects Department during this competitive process. All questions received and the corresponding answers will be distributed to all bidders. No verbal responses will be provided. The deadline for questions about this proposal is stated in the Bid Activities and the district will not respond to questions after this time and date. Response to questions will be posted in the ebid system. The vendors will be responsible for checking the ebid system for any posted responses.

4 Attachments Required

Be sure to upload all required documents and forms to the "Response Attachments" tab of this bid event.

5 Proposal Opening

Any proposal received later than the specified time, whether delivered in person or by any other method shall be disqualified. Any questions pertaining to the proposal procedures should be addressed to the Capital Projects Department at capitalprojects@galenaparkisd.com. If the District office location where bids/proposals are to be submitted is closed due to inclement weather, natural disaster, or for any other cause including if the electronic bid system is unavailable on the due date, the deadline for submission shall be extended until the next District business day, unless the bidder is otherwise notified by the District. The time of day for submission shall remain the same.

6 Submission Required PRIOR to Proposal Opening

The following forms are required **5 days prior to the proposal opening**:

- OSHA (Occupational Safety and Health Administration) inspection logs for the last three years, a loss analysis from the Offeror's insurance carrier, and a loss history covering all lines of insurance coverage carried by the Offeror.
- Qualification Statement (AIA Document A305).
- A list of at least five (5) projects of similar scope as the project being proposed of which have been completed in the last five (5) years.
- Contractor's Proposed Project Personnel.

Forms should be submitted to the Architect/Engineer at DKampfhenkel@emaengineer.com.

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INSTRUCTIONS TO PROPOSERS FOR CONTRACTS FOR CONSTRUCTION

8 INSTRUCTIONS TO PROPOSERS FOR CONTRACTS FOR CONSTRUCTION

ARTICLE 1. DEFINITIONS

1.0 Definitions set forth in the GPISD General Conditions of the Contract for Construction, or in other Proposal Documents, are applicable to the Proposal Documents.

1.1 Proposal Documents: Advertisement for Competitive Sealed Proposals, Instructions to Proposers, Proposal Security, Proposal Form, Felony Conviction Notice, Affidavit of Non-collusion, Certificate of Residency, the Drawings and the Project Manual.

1.2 Sub-proposer: A person or entity who submits a proposal to a Proposer for materials, equipment or labor for a portion of the Work.

1.3 Addenda: Written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Proposal Documents by additions, deletions, clarifications or corrections.

1.4 Proposal: A complete and properly signed Proposal to do the Work for the sums stipulated therein, submitted in accordance with the Proposal Documents.

1.5 Base Proposal: The sum stated in the Proposal for which the Proposer offers to perform the Work described in the Proposal Documents as the Base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Proposals.

1.6 Alternate Proposal (or Alternate): An amount stated in the Proposal to be added to, or deducted from, the amount of the Base Proposal if the corresponding change in the Work, as described in the Proposal, is accepted by the Owner.

1.7 Unit Price: An amount stated in the Proposal as a price per unit of measurement to add or delete for labor, materials, and equipment or services or a portion of the Work as described in the Proposal Documents.

1.8 Proposer: A person or entity who submits a Proposal.

1.9 Safety Record: An offeror's OSHA (Occupational Safety and Health Administration) inspection logs for the last three years, a loss analysis from the Offeror's insurance carrier, and a loss history covering all lines of insurance coverage carried by the Offeror.

ARTICLE 2. PROPOSER'S REPRESENTATIONS

2.1 The Proposer by making a Proposal represents that:

2.1.1 The Proposer has read and understands the Proposal Documents and the Proposal is made in accordance therewith.

2.1.2 The Proposer has visited the site; has become familiar with local conditions under which the Work is to be performed; and has correlated the Proposer's personal observations with the requirements of the Proposal Documents.

2.1.3 The Proposal is based upon the materials, equipment and systems required by the Proposal Contract Documents without exception.

ARTICLE 3. PROPOSAL DOCUMENTS

3.1 Copies

3.1.1 Proposers may obtain complete sets of the Proposal Documents from the issuing office designated in the Advertisement for Sealed Proposals in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Proposers who return the Documents to the issuing office in good condition and in good order within ten days after proposal opening. The cost of replacement of missing or damaged Documents will be deducted from the deposit. A Proposer receiving a Contract award may retain the Documents and the Proposer's deposit will be refunded.

3.1.2 Proposal Documents will not be issued for deposit directly to Sub-proposers or others unless specifically offered in the Advertisement for Sealed Proposals, or in the Instructions to Proposers.

3.1.3 Additional complete sets of Proposal Documents, if available, may be obtained by Proposers and Sub-proposers from the issuing office for the cost of reproduction and mailing, which costs are not refundable. It shall be understood by entities obtaining additional sets and paying the reproduction and mailing costs that such additional sets remain the Owner's exclusive property and shall be returned to the office from where the Proposal Documents were issued.

3.1.4 Proposal Documents will also be issued to plan rooms in those cities which are likely to be home locations of Proposers and Sub-proposers.

3.1.5 Proposers shall use complete sets of Proposal Documents in preparing Proposals; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Proposal Documents.

3.1.6 In making copies of the Proposal Documents available on the above terms, the Owner and the Architect do so only for the purpose of obtaining Proposals on the Work; and do not confer a license or grant permission for any other use of the Proposal Documents.

3.2 Interpretation or Correction of Proposal Documents

3.2.1 The Proposer shall carefully study and compare the Proposal Documents with each other, and with other work being proposed concurrently or presently under construction to the extent that it relates to the Work for which the Proposal is submitted; shall examine the site and local conditions; and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

3.2.2 Proposers and Sub-proposers requiring clarification or interpretation of the Proposal Documents shall make a written request which shall reach the Architect at least 10 working days prior to the date for receipt of Proposals.

3.2.3 Interpretations, corrections and changes of the Proposal Documents will be made by addendum. Interpretations, corrections and changes of the Proposal Documents made in any other manner will not be binding, and Proposers shall not rely upon them.

3.3 Substitutions

3.3.1 The materials, products and equipment described in the Proposal Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

3.3.2 No substitution will be considered prior to receipt of Proposals unless a written request for approval has been received by the Architect at least ten days prior to the date for receipt of Proposals. Such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work (including changes in the work of other contracts that incorporation of the proposed substitution would require) shall be included. The burden of proof of the merit of the proposed substitution is upon the Proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

3.3.3 If the Architect approves a proposed substitution prior to receipt of Proposals, such approval will be set forth in an Addendum. Proposers shall not rely upon approvals made in any other manner.

3.3.4 No substitutions will be considered after the Contract award unless specifically provided for in the Proposal Documents.

3.4 Addenda

3.4.1 Addenda will be mailed, faxed or Contractor shall pick up to those known by the issuing office to have received a complete set of Proposal Documents.

3.4.2 Copies of Addenda will be made available for inspection wherever Proposal Documents are on file for that

purpose.

3.4.3 Each Proposer shall ascertain prior to submitting a Proposal that the Proposer has received all Addenda issued; and the Proposer shall acknowledge their receipt on the Proposal Form.

ARTICLE 4. PROPOSAL PROCEDURES

4.1 Form and Style of Proposals

4.1.1 Proposals shall be submitted on forms included with the Proposal Documents.

4.1.2 All blanks on the Proposal Form shall be filled in electronically or manually in ink.

4.1.3 Where so indicated by the makeup of the Proposal Form, sums shall be expressed in both words and figures, and in cases of discrepancy between the two, the amount written in words shall govern.

4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Proposal.

4.1.5 All requested Alternates shall be proposed. If no change in the Base Proposal is required, enter "No Change."

4.1.6 Where two or more Proposals for designated portions of the Work have been requested, the Proposer may, without forfeiture of the proposal security, state the Proposer's refusal to accept award of less than the combination of Proposals stipulated by the Proposer. The Proposer shall make no additional stipulations on the Proposal Form nor qualify the Proposal in any other manner.

4.1.7 Each copy of the Proposal shall include the legal name of the Proposer and a statement that the Proposer is a sole proprietor, partnership, corporation or other legal entity. Each copy shall be signed by the person or persons legally authorized to bind the Proposer to a contract. A Proposal by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Proposal submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Proposer.

4.1.8 To be considered complete, the Proposal shall include the following attributes and/or forms completely and accurately filled out and executed:

Proposal Form (including Alternate Proposals if applicable)
Bid Bond - 5%
Felony Conviction Notice
Affidavit of Non-collusion
Certificate of Residency
Verification of Business Type
Conflict of Interest Questionnaire
Subcontractor Listing
Texas and Federal Certifications
Certificate of Interested Parties – Form 1295
Certification of Criminal History Record Information
Request for Taxpayer Identification Number and Certification (W-9)

4.1.9 For additional proposal information and requirements refer to the following:

Proposal Phase Procedures
Contractor Proposed Project Personnel

4.2 Bid Bond and Insurance

4.2.1 If so stipulated in the Advertisement for Sealed Proposals, or the Instructions to Proposers, each Proposal shall be accompanied by a Bid Bond in the form and amount required, pledging that the Proposer will enter into a Contract with the Owner on the terms stated in the Proposal and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Proposer refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the Proposal Security shall be forfeited to the Owner as liquidated damages, not as a penalty.

4.2.2 If a Bid Bond is required it may be written on the Owner's standard form, a copy of which is included with the Proposal Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

4.2.3 The Owner will have the right to retain the Proposal Security of Proposers to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Proposals may be withdrawn, or (c) all Proposals have been rejected.

4.2.4 The Proposer shall provide the required insurance prior to the issuing of the Notice to Proceed. Should the Proposer fail to furnish such Insurance, the amount of the Proposal Security shall be forfeited to the Owner as liquidated damages, not as a penalty.

4.3 Submission of Proposals

4.3.1 All copies of the Proposal, the Proposal Security, if any, and other documents required to be submitted with the Proposal shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Proposals and shall be identified with the Project Name, the Owner's Project Number, the Proposer's name and address and if applicable, the designated portion of the Work for which the Proposal is submitted, If the Proposal is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED PROPOSAL ENCLOSED" on the face thereof.

4.3.2 Proposals shall be deposited at the designated location prior to the time and date for receipt of Proposals. Proposals received after the time and date for receipt of Proposals will be returned unopened.

4.3.3 The Proposer shall assume full responsibility for timely delivery at the location designated for receipt of Proposals.

4.3.4 Oral, telephonic, telegraphic Proposals or revisions noted on the outside of the sealed opaque envelope are invalid and will not receive consideration.

4.4 Modification or Withdrawal of Proposal.

4.4.1 A Proposal may not be modified, withdrawn or canceled by the Proposer for a period of sixty (60) calendar days following the time and date designated for the receipt of Proposals, and each Proposer so agrees in submitting a Proposal.

4.4.2 Prior to the time and date designated for receipt of Proposals, a Proposal submitted may be modified or withdrawn by notice to the party receiving Proposals at the place designated for receipt of Proposals. Such notice shall be in writing over the signature of the Proposer or by telegram. If by telegram, written confirmation over the signature of the Proposer shall be mailed and postmarked on or before the date and time set for receipt of Proposals. A change shall be so worded as not to reveal the amount of the original Proposal.

4.4.3 Withdrawn Proposals may be resubmitted up to the date and time designated for the receipt of Proposals provided that they are then fully in conformance with these Instructions to Proposers.

4.4.4 Proposal Security, if required, shall be in an amount sufficient for the Proposal as modified or resubmitted.

ARTICLE 5. PRE & POST PROPOSAL INFORMATION

5.1 Submittals

5.1.1 Upon request by the Owner, Proposers shall provide the following:

- .1 a designation of the Work to be performed with the Proposer's own forces;
- .2 names of the manufacturers, products and the suppliers of principal items or systems of materials and equipment proposed for the Work; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

5.1.2 The Proposer will be required to establish to the satisfaction of the Architect and the Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Proposal

Documents.

5.1.3 Prior to the award of the Contract, the Architect will notify the Proposer in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Proposer. If the Owner or Architect has reasonable objection to a proposed person or entity, the Proposer may at the Proposer's option (1) withdraw the Proposal, or (2) submit an acceptable substitute person or entity with an adjustment in the Base Proposal or Alternate Proposal to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted proposal price or disqualify the Proposer. In the event of either withdrawal or disqualification, Proposal Security will not be forfeited.

5.1.4 Persons and entities proposed by the Proposer, and to whom the Owner and Architect have made no reasonable objection, must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

5.1.5 The District encourages and welcomes the participation of small, minority, and women owned firms in this solicitation. Additionally, the selected firm will be required to take all affirmative steps set forth in 2 CFR Part 200 to solicit and reach out to small, minority and women owned firms for any sub-consulting opportunities for the project.

ARTICLE 6. CONSIDERATION OF PROPOSALS

6.1 Opening of Proposals

6.1.1 Unless stated otherwise in the Advertisement for Sealed Proposals, the properly identified Proposals received on time will be opened publicly and will be read aloud. An abstract of the Proposals will be made available to Proposers.

6.2 Rejection of Proposals

6.2.1 The Owner shall have the right to reject any or all Proposals, reject a Proposal not accompanied by a required Proposal Security or by other data required by the Proposal Documents, or reject a Proposal which is in any way incomplete or irregular.

6.3 Acceptance of Proposals (Award)

6.3.1 It is the intent of the Owner to award a Contract to the Proposer deemed to be in the best interests of Galena Park I.S.D. provided the Proposal has been submitted in accordance with the requirements of the Proposal Documents and does not exceed the funds available. The Owner shall have the right to waive informalities or irregularities in a Proposal received and to accept the Proposal which, in the Owner's judgment, is in the Owner's own best interests.

6.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Proposal Documents, and to determine the low Proposer on the basis of the sum of the Base Proposal and Alternates accepted.

6.4 The Owner will use the following criteria with respect to evaluating the proposals:

Per centCriteria	Proposal Section
40 % Purchase price	Line Items
20 % Reputation, quality, and long-term value to the Owner (Warranty) of the Offeror's goods and services, and safety record of the Offeror	Exhibit A – A305, Exhibit B – A305, Exhibit C – A305, Exhibit D – A305, Exhibit E – A305
10 % Qualifications of the Offeror's proposed project team	Contractor's Proposed Project Personnel Attribute and Response Attachment, Exhibit C – A305
15 % Qualifications and reputation of the Offeror's proposed subcontractors	Line Items Subcontractor Listing
15 % Proposed schedule	Proposed Schedule Response Attachment

ARTICLE 7. PERFORMANCE AND PAYMENT BONDS

7.1 Bond Requirements

7.1.1 If stipulated in the Proposal Documents, the Proposer shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Proposer's usual sources.

7.1.2 If the furnishing of such bonds is stipulated in the Proposal Documents, the cost shall be included in the Proposal.

7.2 Time of Delivery and Form of Bonds

7.2.1 The Proposer shall deliver the required bonds to the Owner not later than ten days following the date of execution of the Contract.

7.2.2 Unless otherwise provided, the bonds shall be written on the Owner's standard forms for performance and payment bonds, copies of which are included in the Proposal Documents. Both bonds shall be written in the amount of the Contract Sum.

7.2.3 The bonds shall be dated on or after the date of the Contract.

7.2.4 The Proposer shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 8. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

8.1 Form to be used

8.1.1 The Agreement for the Work will be written on the Owner's standard form of agreement, a copy of which is included in the Proposal Documents.

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PROJECT INFORMATION

10 Project information

Project Name: Cimarron Elementary School HVAC Upgrades and Replacement
Address: 816 Cimarron St, Houston, TX 77015
Project #: E130

Total Project Budget: \$293,000.00

Substantial Completion Date: December 2, 2022

Responsible Party:

Firm	Contact Name	Email
Architect/ Estes, McClure & Associates, Inc. Engineer 328 S. Broadway Ave., Tyler, TX 75702 Civil Structural MEP	Daniel Kampfhenkel	DKampfhenkel@emaengineer.com

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PROPOSAL ACKNOWLEDGEMENT

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2 **Proposal Acknowledgement**

Having carefully examined the Proposal Documents for the Project and all Addenda thereto, as well as the site of the proposed Work and all the conditions affecting the Work, the undersigned proposes to furnish all labor, materials, services and equipment necessary to complete the entire Work in accordance with the Proposal Documents for the sums submitted on the Bid Lines tab.

BASE PROPOSAL: The undersigned agrees to perform all work required by the Proposal Documents which is not specifically indicated to be proposed as an Alternate.

ALTERNATE PROPOSALS: If the Owner elects to require increases, decreases or changes in the Work specifically described in the Proposal Documents as Alternates, the undersigned agrees to perform such increases, decreases or changes for the sums stated below. The undersigned also understands that the Owner reserves the right to accept or reject any alternate proposal in the order of its choosing and to suit available funding.

The undersigned further agrees, if awarded the Contract, to complete all work required by the Proposal Documents in the number of calendar days after Notice to Proceed or by the specific date stipulated in the Proposal Documents.

The undersigned further agrees that the Proposal Security, payable to the Board of Trustees of the Galena Park Independent School District, accompanying this proposal is left in escrow with the Chief Finance Officer of the Galena Park Independent School District; that its amount is measure of the liquidated damages which the Owner will sustain by the failure of the undersigned to execute and deliver the above named Agreement and Bonds, and that if the undersigned defaults in executing that Agreement or in furnishing the Performance and Payment Bonds or insurance certificates within the stipulated time period following the written notification of the award of the Contract, then the check shall become the property of the Owner, or the Bid Bond shall become subject to forfeiture to the Owner.

It is understood that the Owner reserves the right to accept or reject any and all Proposals and to waive formalities or irregularities as it deems to serve its best interests. It is further agreed that this Proposal shall be valid and not withdrawn within a period of sixty (60) days from the date of opening thereof. Withdrawal of Proposal within the stipulated sixty-day period may result in the forfeiture of the Proposal Security.

The work to be performed under this Contract shall be commenced within ten (10) days from the date of the Notice to Proceed issued by the Owner and the Contractor shall achieve Substantial Completion within the time stipulated in the Supplementary Conditions of the Contract, subject to adjustments of this Contract Time as provided elsewhere in the Proposal Documents. The time set forth for completion of the Work is an essential element of the Contract.

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3 **Header**

PROPOSAL BOND FOR BUILDING CONSTRUCTION CONTRACTS

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4 **Bid Bond for Building Construction Contracts**

A. Each individual Proposal package submitted must be accompanied by Bid Bond made payable to Owner in an amount of five percent (5%) of the Proposal price (for Bid bond purposes, the Bid price shall include the base Proposal, plus all alternates; however, the Contract price shall be as awarded by Galena Park Independent School District). Bid Bond shall be in the form of a Cashier's Check or a Bid Bond, duly executed by proposer as principal and having as surety thereon, a corporate surety company duly authorized and admitted to do business in the State of Texas and licensed by the State of Texas to issue such bond, as a guarantee that the proposer will enter into a Contract and execute required Performance and Payment Bonds within ten (10) days of Galena Park Independent School District award of Contract.

B. Each Proposal must be accompanied by information establishing that the agent signing the bond is authorized to write the bond in the amount requested, and if applicable, that reinsurance requirements, have been met, including limits and ratings or other evidence of company solvency.

C. Proposer must demonstrate to Owner that he can secure required bonds, issued by a corporate surety company authorized and admitted to do business in the State of Texas and licensed in the State of Texas to issue such bond, which bonds shall be written in the form contained in the Project Manual without modification.

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5 Header **FELONY CONVICTION NOTICE**

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6 **Felony Conviction Notice**
State of Texas Legislative Senate Bill No.1, Section 44.034, Notification of Criminal History, Subsection (a), states “A person or business entity that enters into a contract with a school district must give advance notice to the district if the person or an owner or operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony.” Subsection (b) states “A school district may terminate a contract with a person or business entity if the district determines that the person or business entity failed to give notice as required by Subsection (a) or misrepresented the conduct resulting in the conviction. The district must compensate the person or business entity for services performed before the termination of the contract.” Is your firm owned or operated by anyone who has been convicted of a felony?

Subsection (c) states, “This notice is not required of a publicly held corporation.”

A. My firm is publicly-held corporation; therefore, this reporting requirement is not applicable.
B. My firm is not owned or operated by anyone who has been convicted of a felony.
C. My firm is owned or operated by the following individual(s) who has/have been convicted of a felony (Must complete next section)

 A Publicly-held corporation; N/A B Not owned/operated by anyone convicted of felony
 C Is owned/operated by anyone convicted of felony
(Required: Check only one)

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7 **Felony Conviction Details**
If your firm is owned or operated by anyone who has been convicted of a felony, please list

- name(s)
- date(s) of conviction(s)
- details of the conviction(s)

If not applicable, please enter N/A (not applicable).

(Required: Maximum 4000 characters allowed)

1
8 Header **AFFIDAVIT OF NON-COLLUSION**

1
9 **Anti-Collusion Statement**
The undersigned affirms that they are duly authorized to execute this proposal, that this company, corporation, firm, partnership or individual has not prepared this proposal in collusion with any other proposer, and that the contents of this proposal as to prices, terms or conditions of said proposal have not been communicated by the undersigned nor by any employee or agent to any other person engaged in this type of business prior to the official opening of this proposal.

 I agree.
(Required: Check if applicable)

2
0 Header **VERIFICATION OF BUSINESS TYPE**

2
1 **Verification of Business Type**

Sole Proprietor Partnership Corporation (provide state of incorporation)

Other (provide detail in next attribute)

(Required: Check only one)

2
2 **Verification of Business Type**

Provide state of incorporation or additional details if applicable

(Optional: Maximum 1000 characters allowed)

2
3 **Header**

CONFLICT OF INTEREST QUESTIONNAIRE

2
4 **Conflict of Interest Questionnaire**

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session. Instructions on filling this form can be found in the attachments tab.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. See Section 176.006(a-1), Local Government Code.

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

Local government officers:

Board of Trustees & Superintendent of Schools

Name	Position
Adrian Stephens	President
Noe Esparza	Vice President
Norma Hernandez	Secretary
Wanda Heath Johnson	Board Trustee
Ramon Garza	Board Trustee
Herbert Alexander Sanchez	Board Trustee
Linda Clark Sherrard	Board Trustee
Dr. John C. Moore	Superintendent of Schools

Does this vendor have conflict of interest with Galena Park Independent School District?

Yes No

(Required: Check only one)

2
5 **Header**

PROPOSAL PHASE PROCEDURES

2
6 **Proposer Qualification Statements**

CONDITIONS OF THE CONTRACT, SUPPLEMENTARY CONDITIONS AND DIVISION 1 APPLY TO THIS SECTION.

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section contains procedures to be followed by general contractor proposers and sub-contractors / material suppliers during the proposal phase of the project.

1.2 RELATED WORK

- A. All sections of specifications contained in the Project Manual.
- B. All drawings issued as Contract Documents
- C. All Addenda issued during the proposal phase.

1.3 SUBMITTALS

- A. Qualification Statements
- B. Project Lists
- C. References

1.4 QUALITY ASSURANCE

- A. The Proposer's Qualification Statement, including accompanying documents, is the primary tool used in the Competitive Sealed Proposal evaluation process. It is the Proposer's opportunity to demonstrate their strengths and qualifications.
- B. It is the Proposer's sole responsibility to provide complete information on all required submittal documents.
- C. It is the Proposer's sole responsibility to provide reference information that is current, accurate and viable; in that the references submitted shall respond.
 - 01 Evaluation requests for reference input shall be distributed to references by fax or email.
 - 02 No attempt shall be made by the Architect to correct inaccurate information submitted by the Proposer.
 - 03 Non-responses from Proposer's references shall have a negative impact on the Proposer in the evaluation process.
- D. It is the Proposer's sole responsibility to provide Qualification Statement, including accompanying documents in a timely manner to allow ample time for reference inquiries and responses, and other evaluation processes.
 - 01 No attempt shall be made by the Architect to expedite responses from references submitted by the Proposer.
 - 02 Non-responses from Proposer's references shall have a negative impact on the Proposer in the evaluation process.

PART 2 – PROCEDURES

2.1 PROPOSER QUALIFICATION STATEMENTS

A. Proposer Qualification Statements are the primary vehicle used by the project evaluation members to assess the credentials of the Proposer with respect to evaluation criteria set forth in the Project Manual leading to the recommendation for award of Contract.

01 It is the sole responsibility of the Proposer to assure the information provided as reference is accurate, current, useful and verifiable.

B. In order to receive full consideration during the proposal evaluation period, each Proposer must submit a completed Qualification Statement (AIA Document A305) to the Architect and Owner according to the "Submission Required PRIOR to Proposal Opening" attribute.

01 Qualification Statements received after the "Submission Required PRIOR to Proposal Opening" deadline shall be accepted and processed; however, the proposer shall bear any / all consequences of a less than adequate evaluation due to a late submission.

02 Fax submissions will not be accepted.

C. In addition to the information required in AIA A305 Qualification Statement, each proposer shall submit the following specific information attached to the Qualification Statement:

01 A list of at least five (5) projects of similar scope as the project being proposed on which have been completed in the last five (5) years. Referenced projects to include the following information:

- a. Project Name and Location
- b. Project Completion Date
- c. Final Project Cost
- d. Owner's Name and Contact Information (current phone number, fax number, and email address.).

- e. Architect's Project Manager Name and Contact Information (current phone number and fax number).
 - 02 A list of at least five (5) references of Owners and five (5) Architects which the proposer has completed work for in the last five (5) years including the following information:
 - a. Name and Contact Information (current phone number, fax number, and email address).
 - 03 A list of all projects completed in the last three (3) years including the following information:
 - a. Project Name and Location
 - b. Project Completion Date
 - c. Final Project Cost
 - d. Owner's Name and Contact Information (current phone no. and fax no.).
 - e. Architect's Project Manager Name and Contact Information (current phone no. and fax no.).
- D. Any other information the Proposer wishes to submit to be used in the evaluation process.

2.2 ELECTRONIC AVAILABILITY OF PROPOSAL DOCUMENTS

A. Proposal documents – drawings, specifications and addenda – shall be posted on the GPISD eBid system at <https://galenaparkisd.ionwave.net/Login.aspx>.

B. Any Proposer obtaining proposal documents only from the web location above, without obtaining hard copy documents by deposit, MUST register as a plan holder / GC proposer with the Architect/Engineer on record .

- 01 Addenda shall only be sent to plan holders registered with the Architect/Engineer on record.
- 02 Only registered plan holders shall be included on the 'list of general contractors'.

2.3 PROPOSAL PHASE - REQUEST FOR INFORMATION

- A. All Requests For Information (RFI) during the Proposal Phase should be made in writing (email preferred). Requests by telephone shall be accepted only at the discretion of the recipient.
- B. Proposal RFI's should be made directly to the responsible party/consultant per the project information attribute.
- C. All Proposal RFI's shall be responded to in writing by return fax or email only to the original sender.
- D. Official changes to the Contract Documents originating from Proposal RFI's shall be issued by Addendum to all plan holders.

2.4 ADDENDA

- A. All Addenda shall be issued by the Architect/Engineer on record.
- B. Generally, each Addendum shall be limited to a single discipline (Architectural, MEP, Civil, Structural, etc.), containing only Contract Document changes relative to that discipline.
- C. Unless specific request by a Proposer to the contrary, all Addenda shall be issued electronically in .pdf format by email and incorporated in the district ebid system.
- D. Paper copies shall be available for pick-up at the Architect/Engineer on record's office at the request of any Proposer.
- E. All Addenda will be posted to Architect/Engineer's website for proposer's viewing.
- F. Re-issued, full-size sheets shall be distributed to each plan holder in quantity(s) equal to the number of Proposal Document sets acquired from the Architect on a deposit basis.

28	Contractor's Proposed Project Personnel An item of the evaluation criteria used to select the successful general contractor to perform this work is the qualifications of the Contractor's project team proposed to be assigned to this project. Please submit the names of the personnel in the spaces provided.
-----------	---

29	Principal in Charge <hr/> <hr/> <hr/> <i>(Required: Maximum 1000 characters allowed)</i>
-----------	---

30	Project Manager <hr/> <hr/> <hr/> <i>(Required: Maximum 1000 characters allowed)</i>
-----------	---

31	Assistant Project Manager (as applicable) <hr/> <hr/> <hr/> <i>(Optional: Maximum 1000 characters allowed)</i>
-----------	---

32	Construction Superintendent <hr/> <hr/> <hr/> <i>(Required: Maximum 1000 characters allowed)</i>
-----------	---

33	Assistant Superintendent (as applicable) <hr/> <hr/> <hr/> <i>(Optional: Maximum 1000 characters allowed)</i>
-----------	--

34	Header <p style="text-align: center;">ANTITRUST CERTIFICATION STATEMENT</p>
-----------	--

3
5 **Antitrust Certification Statement**

Per Tex. Government Code § 2155.005

I affirm under penalty of perjury of the laws of the State of Texas that:

1. I am duly authorized to execute this contract on my own behalf or on behalf of the company, corporation, firm, partnership or individual (Company)
2. In connection with this bid, neither I nor any representatives of the Company have violated any provision of the Texas Antitrust laws codified in Tex. Bus. & Comm. Code Chapter 15;
3. In connection with this bid, neither I nor any representative of the Company have violated any federal antitrust law; and
4. Neither I nor any representatives of the Company have directly or indirectly communicated any of the contents of this bid to a competitor of the Company or any other company, corporation, firm, partnership or individual engaged in the same line of business as the Company.

Agree Do Not Agree

(Required: Check only one)

3
6 **Form 1295 - Certificate of Interested Parties**

Pursuant HB 1295, the addition of section 2252.908 of the Government Code, all awarded vendors must fill out electronically, with the Texas Ethics Commission's online filing application.

www.ethics.state.tx.us.whatsnew/elf_info_form1295.htm

The law states that a governmental entity or state may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties (Form 1295) to the governmental entity or state agency at the time the business entity submits the signed contract to the governmental or state agency. The Texas Ethics Commission has adopted rules requiring the business to file Form 1295 electronically with the Commission. This form must then be signed and attached in the "Response Attachments" tab of this bid event, prior to any business transaction.

Please note the following:

Box 2: Please enter Galena Park ISD

Box 3: Please use **CSP# 22-204** as the identification number being requested and **Cimarron Elementary School HVAC Upgrades and Replacement** as description of goods or services.

Please acknowledge that you have read and understand that the district may not do business with your company without the submittal of this form.

Yes No

(Required: Check only one)

3
7 **Header**

CONTRACT DOCUMENTS (for bidding purposes only)

3
8 **Contract Documents (for bidding purposes only)**

The Contract Documents (for bidding purposes only) are provided in the attachments tab. Please check if you agree or disagree to the Terms of the Agreement as presented. This is your electronic signature.

I have Read and Agree

(Required: Check only one)

3
9 **No Deviations or Exceptions**

I certify that there are NO deviations or exceptions from the attached specific terms, conditions, and specifications.

Agree - No Deviations Do Not Agree - Please see below

(Required: Check only one)

40 Deviations and Exceptions

If your company intends to deviate from the Specifications listed in the attached documents, all such deviations and exceptions must be listed here, with complete and detailed conditions and information included. The District will consider any deviations or exceptions in its bid award decisions. The District reserves the right to accept or reject any proposals based upon any deviations indicated below. If none, please enter N/A (Not Applicable).

(Required: Maximum 4000 characters allowed)

Bid Lines

1 Package Header

BASE PROPOSAL

Total: \$ _____

Item Notes: The undersigned agrees to perform all work required by the Proposal Documents which is not specifically indicated to be proposed as an Alternate for the sum of:

Package Items

1.1 BASE PROPOSAL:

(Response required)

Quantity: 1 UOM: EA Price: \$ _____ Total: \$ _____

Supplier Notes: _____

No bid
 Additional notes
(Attach separate sheet)

1.2 Owner's Contingency Allowance:

Total: \$26,500.00

2 Package Header

SUBCONTRACTOR LISTING

(Line excluded from response total)

Total: \$ _____

Item Notes: One of the evaluation criteria used to select the successful General Contractor is the proposed project team, including sub-contractors to be used for the Work. In order to receive consideration for the award of the Contract, each Proposer must submit a list of sub-contractors proposed be used for the Work.

Recognizing the Proposer may not have firm contractual agreements with sub-contractors immediately following submission of Proposals, an allowance is made to submit two (2) sub-contractors for each trade listed below.

Package Attributes

1. Self Performed

Will your company be self performing ALL work.

Yes, all work is self performed No, we will use subcontractors

(Required: Check only one)

2. Mechanical Primary

(Required: Maximum 100 characters allowed)

3. Mechanical Secondary

(Required: Maximum 100 characters allowed)

4. Electrical Primary

(Required: Maximum 100 characters allowed)

5. Electrical Secondary

(Required: Maximum 100 characters allowed)

6. Plumbing Primary

(Required: Maximum 100 characters allowed)

7. Plumbing Secondary

(Required: Maximum 100 characters allowed)

8. Site Work Primary

(Optional: Maximum 100 characters allowed)

9. Site Work Secondary

(Optional: Maximum 100 characters allowed)

10. Site Utilities Primary

(Optional: Maximum 100 characters allowed)

12. Site Utilities Secondary

(Optional: Maximum 100 characters allowed)

13. Concrete Primary

(Optional: Maximum 100 characters allowed)

14. Concrete Secondary

(Optional: Maximum 100 characters allowed)

15. Masonry Primary

(Optional: Maximum 100 characters allowed)

16. Masonry Secondary

(Optional: Maximum 100 characters allowed)

17. Steel Fabrication Primary

(Optional: Maximum 100 characters allowed)

18. Steel Fabrication Secondary

(Optional: Maximum 100 characters allowed)

19. Steel Erection Primary

(Optional: Maximum 100 characters allowed)

20. Steel Erection Secondary

(Optional: Maximum 100 characters allowed)

21. Dampproofing Primary

(Optional: Maximum 100 characters allowed)

22. Dampproofing Secondary

(Optional: Maximum 100 characters allowed)

23. Fire Sprinkler Primary

(Optional: Maximum 100 characters allowed)

24. Fire Sprinkler Secondary

(Optional: Maximum 100 characters allowed)

25. Roofing Primary

(Optional: Maximum 100 characters allowed)

26. Roofing Secondary

(Optional: Maximum 100 characters allowed)

27. Hollow Metal Primary

(Optional: Maximum 100 characters allowed)

28. Hollow Metal Secondary

(Optional: Maximum 100 characters allowed)

29. SCPL Doors Primary

(Optional: Maximum 100 characters allowed)

30. SCPL Doors Secondary

(Optional: Maximum 100 characters allowed)

31. Finish Hardware Primary

(Optional: Maximum 100 characters allowed)

32. Finish Hardware Secondary

(Optional: Maximum 100 characters allowed)

33. Glass & Glazing Primary

(Optional: Maximum 100 characters allowed)

34. Glass & Glazing Secondary

(Optional: Maximum 100 characters allowed)

35. Gyp Bd Systems Primary

(Optional: Maximum 100 characters allowed)

36. Gyp Bd Systems Secondary

(Optional: Maximum 100 characters allowed)

37. Ceramic Tile Primary

(Optional: Maximum 100 characters allowed)

38. Ceramic Tile Secondary

(Optional: Maximum 100 characters allowed)

39. Flooring Primary

(Optional: Maximum 100 characters allowed)

40. Flooring Secondary

(Optional: Maximum 100 characters allowed)

41. Painting Primary

(Optional: Maximum 100 characters allowed)

42. Painting Secondary

(Optional: Maximum 100 characters allowed)

43. Toilet Partitions Primary

(Optional: Maximum 100 characters allowed)

44. Toilet Partitions Secondary

(Optional: Maximum 100 characters allowed)

45. Toilet Acc's. Primary

(Optional: Maximum 100 characters allowed)

46. Toilet Acc's. Secondary

(Optional: Maximum 100 characters allowed)

47. Casework Primary

(Optional: Maximum 100 characters allowed)

48. Casework Secondary

(Optional: Maximum 100 characters allowed)

49. Fire Alarm Primary

(Optional: Maximum 100 characters allowed)

50. Fire Alarm Secondary

(Optional: Maximum 100 characters allowed)

51. BCMS Primary

(Optional: Maximum 100 characters allowed)

52. BCMS Secondary

(Optional: Maximum 100 characters allowed)

53. Data / Tech Primary

(Optional: Maximum 100 characters allowed)

54. Data / Tech Secondary

(Optional: Maximum 100 characters allowed)

55. Security Primary

(Optional: Maximum 100 characters allowed)

56. Security Secondary

(Optional: Maximum 100 characters allowed)

Package Items

2.1 List the **Name** of the **Primary** and **Secondary** Subcontractor that will be performing work for the trades provided.

Price: \$ Total: \$

No bid

Supplier Information

Company Name: _____

Contact Name: _____

Address: _____

Phone: _____

Fax: _____

Email: _____

Supplier Notes

The undersigned, in submitting this Bid/Proposal and endorsement of same, represents that he/she is authorized to obligate his/her Firm, that he/she is an equal opportunity employer and will not discriminate with regard to race, color, religion, sex, national origin, age or disability unrelated to job performance of this Bid/Proposal; that he/she will abide by all the policies and procedures of Galena Park ISD; and that he/she has read this entire Bid/Proposal package, is aware of the covenants contained herein and will abide by and adhere to the expressed requirements in ALL sections of this Bid/Proposal.

Print Name

Signature

Request for Taxpayer Identification Number and Certification

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

▶ Go to www.irs.gov/FormW9 for instructions and the latest information.

Print or type.
See Specific Instructions on page 3.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.	
2 Business name/disregarded entity name, if different from above	
3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only one of the following seven boxes. <input type="checkbox"/> Individual/sole proprietor or single-member LLC <input type="checkbox"/> Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ▶ _____ Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is another LLC that is not disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner. <input type="checkbox"/> Other (see instructions) ▶ _____	4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3): Exempt payee code (if any) _____ Exemption from FATCA reporting code (if any) _____ <i>(Applies to accounts maintained outside the U.S.)</i>
5 Address (number, street, and apt. or suite no.) See instructions.	Requester's name and address (optional)
6 City, state, and ZIP code	
7 List account number(s) here (optional)	

Part I Taxpayer Identification Number (TIN)

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

Note: If the account is in more than one name, see the instructions for line 1. Also see *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number										
				-			-			
or										
Employer identification number										
				-						

Part II Certification

Under penalties of perjury, I certify that:

- The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
- I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
- I am a U.S. citizen or other U.S. person (defined below); and
- The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

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

Sign Here	Signature of U.S. person ▶	Date ▶
------------------	----------------------------	--------

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to www.irs.gov/FormW9.

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)

- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, later.

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and
4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct. See *What is FATCA reporting*, later, for further information.

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

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien;
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States;
- An estate (other than a foreign estate); or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax under section 1446 on any foreign partners' share of effectively connected taxable income from such business. Further, in certain cases where a Form W-9 has not been received, the rules under section 1446 require a partnership to presume that a partner is a foreign person, and pay the section 1446 withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid section 1446 withholding on your share of partnership income.

In the cases below, the following person must give Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States.

- In the case of a disregarded entity with a U.S. owner, the U.S. owner of the disregarded entity and not the entity;
- In the case of a grantor trust with a U.S. grantor or other U.S. owner, generally, the U.S. grantor or other U.S. owner of the grantor trust and not the trust; and
- In the case of a U.S. trust (other than a grantor trust), the U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person or the U.S. branch of a foreign bank that has elected to be treated as a U.S. person, do not use Form W-9. Instead, use the appropriate Form W-8 or Form 8233 (see Pub. 515, *Withholding of Tax on Nonresident Aliens and Foreign Entities*).

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

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

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.
2. The treaty article addressing the income.
3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.
4. The type and amount of income that qualifies for the exemption from tax.
5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

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

If you are a nonresident alien or a foreign entity, give the requester the appropriate completed Form W-8 or Form 8233.

Backup Withholding

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS 24% of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, payments made in settlement of payment card and third party network transactions, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

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

Payments you receive will be subject to backup withholding if:

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

Certain payees and payments are exempt from backup withholding. See *Exempt payee code*, later, and the separate Instructions for the Requester of Form W-9 for more information.

Also see *Special rules for partnerships*, earlier.

What is FATCA Reporting?

The Foreign Account Tax Compliance Act (FATCA) requires a participating foreign financial institution to report all United States account holders that are specified United States persons. Certain payees are exempt from FATCA reporting. See *Exemption from FATCA reporting code*, later, and the Instructions for the Requester of Form W-9 for more information.

Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you no longer are tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account; for example, if the grantor of a grantor trust dies.

Penalties

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

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

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

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

Specific Instructions

Line 1

You must enter one of the following on this line; **do not** leave this line blank. The name should match the name on your tax return.

If this Form W-9 is for a joint account (other than an account maintained by a foreign financial institution (FFI)), list first, and then circle, the name of the person or entity whose number you entered in Part I of Form W-9. If you are providing Form W-9 to an FFI to document a joint account, each holder of the account that is a U.S. person must provide a Form W-9.

a. **Individual.** Generally, enter the name shown on your tax return. If you have changed your last name without informing the Social Security Administration (SSA) of the name change, enter your first name, the last name as shown on your social security card, and your new last name.

Note: ITIN applicant: Enter your individual name as it was entered on your Form W-7 application, line 1a. This should also be the same as the name you entered on the Form 1040/1040A/1040EZ you filed with your application.

b. **Sole proprietor or single-member LLC.** Enter your individual name as shown on your 1040/1040A/1040EZ on line 1. You may enter your business, trade, or “doing business as” (DBA) name on line 2.

c. **Partnership, LLC that is not a single-member LLC, C corporation, or S corporation.** Enter the entity’s name as shown on the entity’s tax return on line 1 and any business, trade, or DBA name on line 2.

d. **Other entities.** Enter your name as shown on required U.S. federal tax documents on line 1. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on line 2.

e. **Disregarded entity.** For U.S. federal tax purposes, an entity that is disregarded as an entity separate from its owner is treated as a “disregarded entity.” See Regulations section 301.7701-2(c)(2)(iii). Enter the owner’s name on line 1. The name of the entity entered on line 1 should never be a disregarded entity. The name on line 1 should be the name shown on the income tax return on which the income should be reported. For example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a single owner that is a U.S. person, the U.S. owner’s name is required to be provided on line 1. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity’s name on line 2, “Business name/disregarded entity name.” If the owner of the disregarded entity is a foreign person, the owner must complete an appropriate Form W-8 instead of a Form W-9. This is the case even if the foreign person has a U.S. TIN.

Line 2

If you have a business name, trade name, DBA name, or disregarded entity name, you may enter it on line 2.

Line 3

Check the appropriate box on line 3 for the U.S. federal tax classification of the person whose name is entered on line 1. Check only one box on line 3.

IF the entity/person on line 1 is a(n) . . .	THEN check the box for . . .
• Corporation	Corporation
• Individual • Sole proprietorship, or • Single-member limited liability company (LLC) owned by an individual and disregarded for U.S. federal tax purposes.	Individual/sole proprietor or single-member LLC
• LLC treated as a partnership for U.S. federal tax purposes, • LLC that has filed Form 8832 or 2553 to be taxed as a corporation, or • LLC that is disregarded as an entity separate from its owner but the owner is another LLC that is not disregarded for U.S. federal tax purposes.	Limited liability company and enter the appropriate tax classification. (P= Partnership; C= C corporation; or S= S corporation)
• Partnership	Partnership
• Trust/estate	Trust/estate

Line 4, Exemptions

If you are exempt from backup withholding and/or FATCA reporting, enter in the appropriate space on line 4 any code(s) that may apply to you.

Exempt payee code.

- Generally, individuals (including sole proprietors) are not exempt from backup withholding.
- Except as provided below, corporations are exempt from backup withholding for certain payments, including interest and dividends.
- Corporations are not exempt from backup withholding for payments made in settlement of payment card or third party network transactions.
- Corporations are not exempt from backup withholding with respect to attorneys’ fees or gross proceeds paid to attorneys, and corporations that provide medical or health care services are not exempt with respect to payments reportable on Form 1099-MISC.

The following codes identify payees that are exempt from backup withholding. Enter the appropriate code in the space in line 4.

- 1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2)
- 2—The United States or any of its agencies or instrumentalities
- 3—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities
- 4—A foreign government or any of its political subdivisions, agencies, or instrumentalities
- 5—A corporation
- 6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a U.S. commonwealth or possession
- 7—A futures commission merchant registered with the Commodity Futures Trading Commission
- 8—A real estate investment trust
- 9—An entity registered at all times during the tax year under the Investment Company Act of 1940
- 10—A common trust fund operated by a bank under section 584(a)
- 11—A financial institution
- 12—A middleman known in the investment community as a nominee or custodian
- 13—A trust exempt from tax under section 664 or described in section 4947

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 13.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 7
Broker transactions	Exempt payees 1 through 4 and 6 through 11 and all C corporations. S corporations must not enter an exempt payee code because they are exempt only for sales of noncovered securities acquired prior to 2012.
Barter exchange transactions and patronage dividends	Exempt payees 1 through 4
Payments over \$600 required to be reported and direct sales over \$5,000 ¹	Generally, exempt payees 1 through 5 ²
Payments made in settlement of payment card or third party network transactions	Exempt payees 1 through 4

¹ See Form 1099-MISC, Miscellaneous Income, and its instructions.

² However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney reportable under section 6045(f), and payments for services paid by a federal executive agency.

Exemption from FATCA reporting code. The following codes identify payees that are exempt from reporting under FATCA. These codes apply to persons submitting this form for accounts maintained outside of the United States by certain foreign financial institutions. Therefore, if you are only submitting this form for an account you hold in the United States, you may leave this field blank. Consult with the person requesting this form if you are uncertain if the financial institution is subject to these requirements. A requester may indicate that a code is not required by providing you with a Form W-9 with "Not Applicable" (or any similar indication) written or printed on the line for a FATCA exemption code.

A—An organization exempt from tax under section 501(a) or any individual retirement plan as defined in section 7701(a)(37)

B—The United States or any of its agencies or instrumentalities

C—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

D—A corporation the stock of which is regularly traded on one or more established securities markets, as described in Regulations section 1.1472-1(c)(1)(i)

E—A corporation that is a member of the same expanded affiliated group as a corporation described in Regulations section 1.1472-1(c)(1)(i)

F—A dealer in securities, commodities, or derivative financial instruments (including notional principal contracts, futures, forwards, and options) that is registered as such under the laws of the United States or any state

G—A real estate investment trust

H—A regulated investment company as defined in section 851 or an entity registered at all times during the tax year under the Investment Company Act of 1940

I—A common trust fund as defined in section 584(a)

J—A bank as defined in section 581

K—A broker

L—A trust exempt from tax under section 664 or described in section 4947(a)(1)

M—A tax exempt trust under a section 403(b) plan or section 457(g) plan

Note: You may wish to consult with the financial institution requesting this form to determine whether the FATCA code and/or exempt payee code should be completed.

Line 5

Enter your address (number, street, and apartment or suite number). This is where the requester of this Form W-9 will mail your information returns. If this address differs from the one the requester already has on file, write NEW at the top. If a new address is provided, there is still a chance the old address will be used until the payor changes your address in their records.

Line 6

Enter your city, state, and ZIP code.

Part I. Taxpayer Identification Number (TIN)

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

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN.

If you are a single-member LLC that is disregarded as an entity separate from its owner, enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note: See *What Name and Number To Give the Requester*, later, for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local SSA office or get this form online at www.SSA.gov. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at www.irs.gov/Businesses and clicking on Employer Identification Number (EIN) under Starting a Business. Go to www.irs.gov/Forms to view, download, or print Form W-7 and/or Form SS-4. Or, you can go to www.irs.gov/OrderForms to place an order and have Form W-7 and/or SS-4 mailed to you within 10 business days.

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

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

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

Part II. Certification

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

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on line 1 must sign. Exempt payees, see *Exempt payee code*, earlier.

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

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983.

You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983.

You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

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

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

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

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account) other than an account maintained by an FFI	The actual owner of the account or, if combined funds, the first individual on the account ¹
3. Two or more U.S. persons (joint account maintained by an FFI)	Each holder of the account
4. Custodial account of a minor (Uniform Gift to Minors Act)	The minor ²
5. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee ¹
b. So-called trust account that is not a legal or valid trust under state law	The actual owner ¹
6. Sole proprietorship or disregarded entity owned by an individual	The owner ³
7. Grantor trust filing under Optional Form 1099 Filing Method 1 (see Regulations section 1.671-4(b)(2)(i)(A))	The grantor*
For this type of account:	Give name and EIN of:
8. Disregarded entity not owned by an individual	The owner
9. A valid trust, estate, or pension trust	Legal entity ⁴
10. Corporation or LLC electing corporate status on Form 8832 or Form 2553	The corporation
11. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
12. Partnership or multi-member LLC	The partnership
13. A broker or registered nominee	The broker or nominee

For this type of account:	Give name and EIN of:
14. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
15. Grantor trust filing under the Form 1041 Filing Method or the Optional Form 1099 Filing Method 2 (see Regulations section 1.671-4(b)(2)(i)(B))	The trust

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

² Circle the minor's name and furnish the minor's SSN.

³ You must show your individual name and you may also enter your business or DBA name on the "Business name/disregarded entity" name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

⁴ List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships*, earlier.

*Note: The grantor also must provide a Form W-9 to trustee of trust.

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

Secure Your Tax Records From Identity Theft

Identity theft occurs when someone uses your personal information such as your name, SSN, or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity or credit report, contact the IRS Identity Theft Hotline at 1-800-908-4490 or submit Form 14039.

For more information, see Pub. 5027, Identity Theft Information for Taxpayers.

Victims of identity theft who are experiencing economic harm or a systemic problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

Protect yourself from suspicious emails or phishing schemes.

Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to phishing@irs.gov. You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration (TIGTA) at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at spam@uce.gov or report them at www.ftc.gov/complaint. You can contact the FTC at www.ftc.gov/idtheft or 877-IDTHEFT (877-438-4338). If you have been the victim of identity theft, see www.IdentityTheft.gov and Pub. 5027.

Visit www.irs.gov/IdentityTheft to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. commonwealths and possessions for use in administering their laws. The information also may be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payers must generally withhold a percentage of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to the payer. Certain penalties may also apply for providing false or fraudulent information.

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

FORM CIQ

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

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

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. See Section 176.006(a-1), Local Government Code.

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

OFFICE USE ONLY

Date Received

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

2 Check this box if you are filing an update to a previously filed questionnaire. (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 Name of local government officer about whom the information is being disclosed.

Name of Officer

4 Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?

Yes No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?

Yes No

5 Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.

6 Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).

7

Signature of vendor doing business with the governmental entity

Date

CONFLICT OF INTEREST QUESTIONNAIRE
For vendor doing business with local governmental entity

SAMPLE FORM CIQ

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

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

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. See Section 176.006(a-1), Local Government Code.

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

OFFICE USE ONLY

Date Received

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

Company/Independent Contractor's Name

Check this box if you are filing an update to a previously filed questionnaire. (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 Name of local government officer about whom the information is being disclosed.

Enter "N/A" if there is no employment of business relationship

Name of Officer

4 Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.

A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?

Yes

No

At least one box must be checked

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?

Yes

No

At least one box must be checked

5 Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.

If a relationship exists, please describe it here

Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).

7

Signature

Signature of vendor doing business with the governmental entity

Date

Date

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

A complete copy of Chapter 176 of the Local Government Code may be found at <http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.176.htm>. For easy reference, below are some of the sections cited on this form.

Local Government Code § 176.001(1-a): "Business relationship" means a connection between two or more parties based on commercial activity of one of the parties. The term does not include a connection based on:

- (A) a transaction that is subject to rate or fee regulation by a federal, state, or local governmental entity or an agency of a federal, state, or local governmental entity;
- (B) a transaction conducted at a price and subject to terms available to the public; or
- (C) a purchase or lease of goods or services from a person that is chartered by a state or federal agency and that is subject to regular examination by, and reporting to, that agency.

Local Government Code § 176.003(a)(2)(A) and (B):

(a) A local government officer shall file a conflicts disclosure statement with respect to a vendor if:

(2) the vendor:

(A) has an employment or other business relationship with the local government officer or a family member of the officer that results in the officer or family member receiving taxable income, other than investment income, that exceeds \$2,500 during the 12-month period preceding the date that the officer becomes aware that

(i) a contract between the local governmental entity and vendor has been executed;
or

(ii) the local governmental entity is considering entering into a contract with the vendor;

(B) has given to the local government officer or a family member of the officer one or more gifts that have an aggregate value of more than \$100 in the 12-month period preceding the date the officer becomes aware that:

(i) a contract between the local governmental entity and vendor has been executed; or

(ii) the local governmental entity is considering entering into a contract with the vendor.

Local Government Code § 176.006(a) and (a-1)

(a) A vendor shall file a completed conflict of interest questionnaire if the vendor has a business relationship with a local governmental entity and:

(1) has an employment or other business relationship with a local government officer of that local governmental entity, or a family member of the officer, described by Section 176.003(a)(2)(A);

(2) has given a local government officer of that local governmental entity, or a family member of the officer, one or more gifts with the aggregate value specified by Section 176.003(a)(2)(B), excluding any gift described by Section 176.003(a-1); or

(3) has a family relationship with a local government officer of that local governmental entity.

(a-1) The completed conflict of interest questionnaire must be filed with the appropriate records administrator not later than the seventh business day after the later of:

(1) the date that the vendor:

(A) begins discussions or negotiations to enter into a contract with the local governmental entity; or

(B) submits to the local governmental entity an application, response to a request for proposals or bids, correspondence, or another writing related to a potential contract with the local governmental entity; or

(2) the date the vendor becomes aware:

(A) of an employment or other business relationship with a local government officer, or a family member of the officer, described by Subsection (a);

(B) that the vendor has given one or more gifts described by Subsection (a); or

(C) of a family relationship with a local government officer.

GPISD CERTIFICATE OF INTERESTED PARTIES - FORM 1295

Certificate of Interested Parties (Form 1295) – Must be filled out electronically with the Texas Ethics Commission’s online filing application, printed out, signed, and submitted to GPISD with the proposal.

GPISD is required to comply with House Bill 1295, which amended the Texas Government Code by adding Section 2252.908, Disclosure of Interested Parties. Section 2252.908 prohibits GPISD from entering into a contract resulting from this solicitation with a business entity unless the business entity submits a Disclosure of Interested Parties (Form 1295) to GPISD at the time business entity submits the signed contract. Effective January 1, 2018, the Form 1295 requirement does not apply to: (1) a contract with a publicly traded business entity or wholly owned subsidiary of the same; (2) an electric utility; or (3) a gas utility. The Texas Ethics Commission has adopted rules requiring the business entity to file Form 1295 electronically with the Texas Ethics Commission. The following definitions apply:

“Business Entity” means an entity recognized by law through which business is conducted, including a sole proprietorship, partnership, or corporation. TEX. GOV’T CODE § 2252.908(1).

“Interested Party” means a person who has a controlling interest in a business entity with whom GPISD contracts or who actively participates in facilitating the contract or negotiating the terms of the contract, including a broker, intermediary, adviser, or attorney for the business entity. TEX. GOV’T CODE § 2252.908(3).

“Controlling interest” means an Districtship interest or participating interest in a business entity by virtue of units, percentage, shares, stock, or otherwise that exceeds 10 percent; membership on the board of directors or other governing body of a business entity of which the board or other governing body is composed of not more than 10 members; or service as an officer of a business entity that has four or fewer officers, or service as one of the four officers most highly compensated by a business entity that has more than four officers. *Subsection (c) does not apply to an officer of a publicly held business entity or its wholly owned subsidiaries.* TEX. ETHICS COMM. RULE 46.3(c).

“Intermediary” means a person who actively participates in the facilitation of the contract or negotiating the contract, including a broker, adviser, attorney, or representative of or agent for the business entity who receives compensation from the business entity for the person’s participation; communicates directly with the governmental entity or state agency on behalf of the business entity regarding the contract; and is not an employee of the business entity. TEX. ETHICS COMM. RULE 46.3(e).

As a “business entity,” unless an exception applies, Vendors must:

1. Complete Form 1295 electronically with the Texas Ethics Commission using the online filing application, which can be found at https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm
 - a. All Vendors must complete Form 1295, even if no interested parties exist, unless Vendor is a publicly traded business entity or wholly owned subsidiary of the same, an electric utility or a gas utility.
 - b. In Section 2, insert “Galena Park Independent School District”
 - c. In Section 3, insert the GPISD RFP/RFQ # for this proposal
2. Print a copy of the completed form (make sure that it has a computer-generated certification number in the “Office Use Only” box);
3. Have an authorized agent of the business entity sign the form; and
4. Submit the completed, signed Form 1295 by attaching the form to your proposal.

GPISD must notify the Texas Ethics Commission of the receipt of the filed Form 1295 no later than the 30th day after receipt by GPISD. After GPISD acknowledges the Form 1295, the Texas Ethics Commission is required to post the completed Form 1295 to its website within seven business days after receiving notice from GPISD.

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

OFFICE USE ONLY

Complete Nos. 1 - 4 and 6 if there are interested parties.
 Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.

4 Name of Interested Party	City, State, Country (place of business)	Nature of Interest (check applicable)	
		Controlling	Intermediary

5 Check only if there is NO Interested Party.

6 UNSWORN DECLARATION

My name is _____, and my date of birth is _____.

My address is _____, _____, _____, _____, _____.
(street) (city) (state) (zip code) (country)

I declare under penalty of perjury that the foregoing is true and correct.

Executed in _____ County, State of _____, on the _____ day of _____, 20____.
(month) (year)

 Signature of authorized agent of contracting business entity
 (Declarant)

ADD ADDITIONAL PAGES AS NECESSARY

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

OFFICE USE ONLY

Complete Nos. 1 - 4 and 6 if there are interested parties.
 Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.

4 Name of Interested Party	City, State, Country (place of business)	Nature of Interest (check applicable)	
		Controlling	Intermediary

5 Check only if there is NO Interested Party.

6 UNSWORN DECLARATION

My name is _____, and my date of birth is _____.

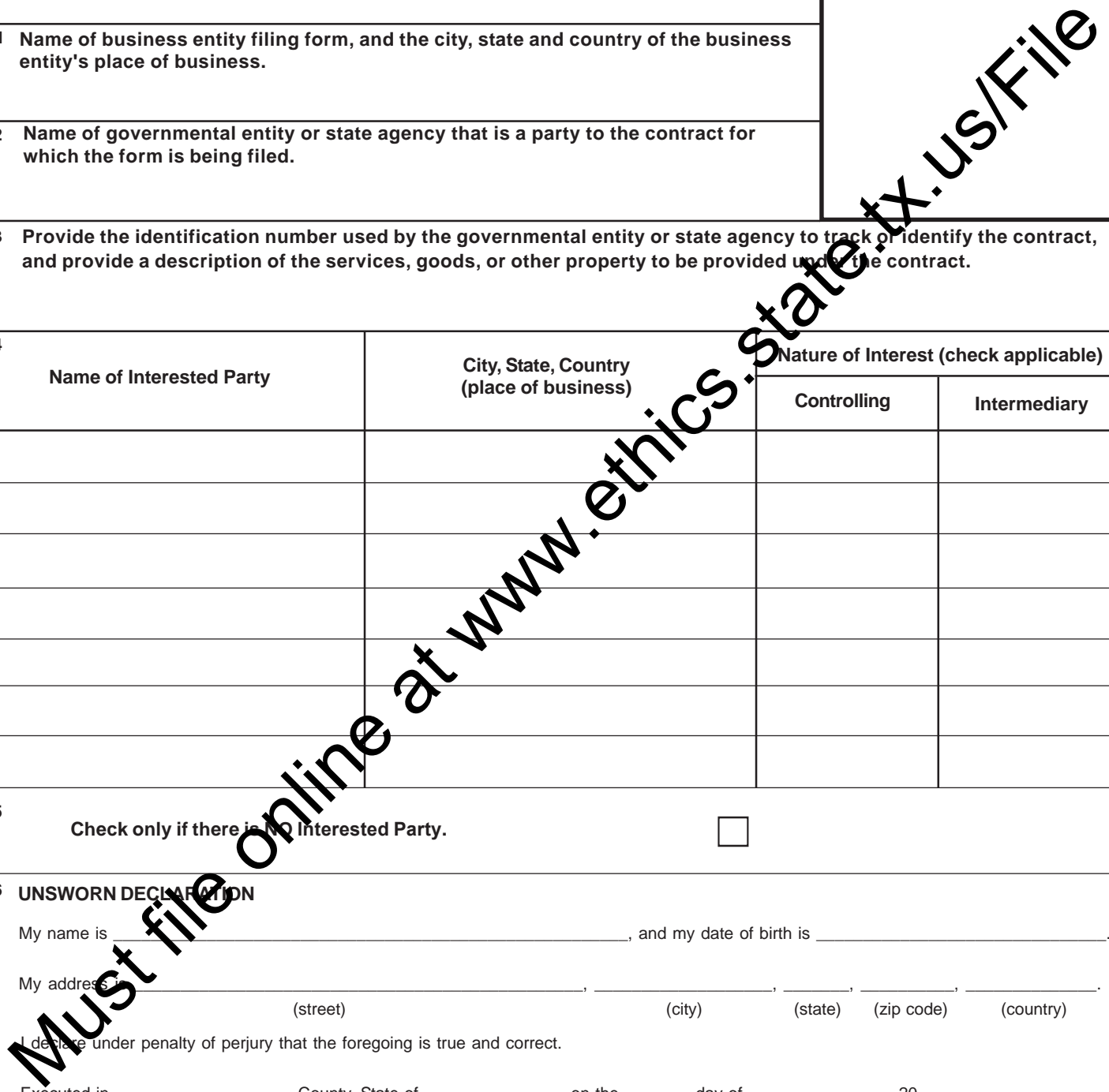
My address is _____, _____, _____, _____, _____.
(street) (city) (state) (zip code) (country)

I declare under penalty of perjury that the foregoing is true and correct.

Executed in _____ County, State of _____, on the _____ day of _____, 20____.
(month) (year)

 Signature of authorized agent of contracting business entity
 (Declarant)

ADD ADDITIONAL PAGES AS NECESSARY



CERTIFICATION FORMS AS OF NOVEMBER 2021

Accordingly, the parties agree that the following terms and conditions apply to the Contract between the District and vendor ("Vendor") to the extent applicable to the contract type or dollar amount:

CERTIFICATION REGARDING TERRORIST ORGANIZATIONS & BOYCOTTING OF ISRAEL

Vendor hereby certifies that it is not a company identified on the Texas Comptroller's list of companies known to have contracts with, or provide supplies or services to, a foreign organization designated as a Foreign Terrorist Organization by the U.S. Secretary of State. Vendor further certifies and verifies that neither Vendor, nor any affiliate, subsidiary, or parent company of Vendor, if any (the "Vendor Companies"), boycotts Israel, and Vendor agrees that Vendor and Vendor Companies will not boycott Israel during the term of this Agreement. For purposes of this Agreement, the term "boycott" shall mean and include terminating business activities or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory.

VERIFICATION REGARDING CONTRACTS WITH COMPANIES THAT BOYCOTT ENERGY COMPANIES

If Vendor is required to make a verification pursuant to Section 2274.002 of the Texas Government Code, Vendor hereby verifies that it does not, and will not for the duration of the contract, boycott energy companies. "Boycott energy company" means, without an ordinary business purpose, refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with a company because the company: (A) engages in the exploration, production, utilization, transportation, sale, or manufacturing of fossil fuel-based energy and does not commit or pledge to meet environmental standards beyond applicable federal and state law; or (B) does business with a company described by Paragraph (A). *[Verification does not apply to a vendor that employs less than 10 full-time employees; AND the value of the contract is less than \$100,000 – Note that the term "company" does not include a sole proprietorship.]*

VERIFICATION REGARDING CONTRACTS WITH COMPANIES THAT DISCRIMINATE AGAINST FIREARMS ENTITY OR TRADE ASSOCIATION

If Vendor is required to make a verification pursuant to Section 2274.002 of the Texas Government Code, Vendor hereby verifies that it (1) does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association and (2) will not discriminate during the term of the contract against a firearm entity or firearm trade association. *[Verification does not apply to a vendor that employs less than 10 full-time employees; AND the value of the contract is less than \$100,000 – Note that the term "company" does not include a sole proprietorship.]*

REQUIRED CONTRACT PROVISIONS FOR NON-FEDERAL ENTITY CONTRACTS UNDER FEDERAL AWARDS APPENDIX II TO 2 CFR PART 200

(A) *[Applicable ONLY to contracts in excess of \$250,000.]* Contracts for more than the simplified acquisition threshold currently set at \$250,000, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate.

Pursuant to Federal Rule (A) above, when the District expends federal funds, the District reserves all rights and privileges under the applicable laws and regulations with respect to this procurement in the event of breach of contract by either party.

(B) *[Applicable ONLY to contracts in excess of \$10,000.]* Termination for cause and for convenience by the grantee or subgrantee including the manner by which it will be affected and the basis for settlement.

Pursuant to Federal Rule (B) above, when the District expends federal funds, the District reserves the right to immediately terminate any agreement in excess of \$10,000 resulting from this procurement process in the event of a breach or default of the agreement by Vendor in the event Vendor fails to: (1) meet schedules, deadlines, and/or delivery dates within the time specified in the procurement solicitation, contract, and/or a purchase order; (2) make any payments owed; or (3) otherwise perform in accordance with the contract and/or the procurement solicitation. The District also reserves the right to terminate the contract immediately, with written notice to vendor, for convenience, if the District believes, in its sole discretion that it is in the best interest of the District to do so. Vendor will be compensated for work performed and accepted and goods accepted by the District as of the termination date if the contract is terminated for convenience of the District. Any award under this procurement process is not exclusive and the District reserves the right to purchase goods and services from other vendors when it is in the District's best interest.

(C) [Applicable ONLY to federally assisted construction contracts.] Equal Employment Opportunity. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of "federally assisted construction contract" in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and implementing regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."

Pursuant to Federal Rule (C) above, when the District expends federal funds on any federally assisted construction contract, the equal opportunity clause is incorporated by reference herein.

(D) [Applicable ONLY to prime construction contracts in excess of \$2,000 where federal funds are being used for the project] Davis-Bacon Act, as amended (40 U.S.C. 3141-3148). When required by Federal program legislation, all prime construction contracts in excess of \$2,000 awarded by non-Federal entities must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. 3141-3144, and 3146-3148) as supplemented by Department of Labor regulations (29 CFR Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the statute, contractors must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must be required to pay wages not less than once a week. The non-Federal entity must place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation. The decision to award a contract or subcontract must be conditioned upon the acceptance of the wage determination. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency. The contracts must also include a provision for compliance with the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Act provides that each contractor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency.

(E) [Applicable ONLY to contracts in excess of \$100,000 involving mechanics or laborers.] Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708). Where applicable, all contracts awarded by the non-Federal entity in excess of \$100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

Pursuant to Federal Rule (E) above, when the District expends federal funds, Vendor certifies that Vendor will be in compliance with all applicable provisions of the Contract Work Hours and Safety Standards Act during the term of an award for all contracts by the District resulting from this procurement process.

(F) Rights to Inventions Made Under a Contract or Agreement. If the Federal award meets the definition of “funding agreement” under 37 CFR §401.2 (a) and the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that “funding agreement,” the recipient or subrecipient must comply with the requirements of 37 CFR Part 401, “Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements,” and any implementing regulations issued by the awarding agency.

Pursuant to Federal Rule (F) above, when federal funds are expended by the District, Vendor certifies that during the term of an award for all contracts by the District resulting from this procurement process, Vendor agrees to comply with all applicable requirements as referenced in Federal Rule (F) above.

(G) [Applicable ONLY to contracts in excess of \$250,000.] Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended—Contracts and subgrants of amounts in excess of \$250,000 must contain a provision that requires the non-Federal award to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251- 1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

Pursuant to Federal Rule (G) above, when federal funds are expended by the District, Vendor certifies that during the term of an award for all contracts by the District resulting from this procurement process, Vendor agrees to comply with all applicable requirements as referenced in Federal Rule (G) above.

(H) Debarment and Suspension (Executive Orders 12549 and 12689)—A contract award (see 2 CFR 180.220) must not be made to parties listed on the government wide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), “Debarment and Suspension.” SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

Pursuant to Federal Rule (H) above, when federal funds are expended by the District, Vendor certifies that during the term of an award for all contracts by the District resulting from this procurement process, Vendor certifies that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation by any federal department or agency.

(I) [Applicable ONLY to contracts in excess of \$100,000] Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)—Contractors that apply or bid for an award exceeding \$100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

Pursuant to Federal Rule (I) above, when federal funds are expended by the District, Vendor certifies that during the term and after the awarded term of an award for all contracts by the District resulting from this procurement process, the vendor certifies that it is in compliance with all applicable provisions of the Byrd Anti-Lobbying Amendment (31 U.S.C. 1352). The undersigned further certifies that:

- (1) No Federal appropriated funds have been paid or will be paid for on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of

- a Federal contract, the making of a Federal grant, the making of a Federal loan, the entering into a cooperative agreement, and the extension, continuation, renewal, amendment, or modification of a Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with this Federal grant or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying", in accordance with its instructions.
 - (3) The undersigned shall require that the language of this certification be included in the award documents for all covered sub-awards exceeding \$100,000 in Federal funds at all appropriate tiers and that all subrecipients shall certify and disclose accordingly.

(J) Procurement of Recovered Materials – When federal funds are expended, the District and its contractors must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include: (1) procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000; (2) procuring solid waste management services in a manner that maximizes energy and resource recovery; and (3) establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

Pursuant to Federal Rule (J) above, when federal funds are expended by the District, as required by the Resource Conservation and Recovery Act of 1976 (42 U.S.C. § 6962(c)(3)(A)(i)), the vendor certifies, by signing this document, that the percentage of recovered materials content for EPA-designated items to be delivered or used in the performance of the contract will be at least the amount required by the applicable contract specifications or other contractual requirements.

(K) Domestic Preferences for Procurements – As appropriate and to the extent consistent with law, the non-Federal entity should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award. For purposes of 2 CFR Part 200.322, "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stag through the application of coatings, occurred in the United States. Moreover, for purposes of 2 CFR Part 200.322, "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum, plastics and polymer-based products such as polyvinyl chloride pipe, aggregates such as concrete, class, including optical fiber, and lumber.

Pursuant to Federal Rule (K) above, when federal funds are expended by the District, vendor certifies, by signing this document, that to the greatest extent practicable vendor will provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products).

(L) Ban on Foreign Telecommunications – Federal grant funds may not be used to purchase equipment, services, or systems that use "covered telecommunications" equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. "Covered telecommunications" means purchases from Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities), and video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

Pursuant to Federal Rule (L) above, when federal funds are expended by the District, vendor certifies, by signing this document, vendor will not purchase equipment, services, or systems that use "covered telecommunications", as defined by 2 CFR §200.216, equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

RECORD RETENTION REQUIREMENTS FOR CONTRACTS INVOLVING FEDERAL FUNDS

When federal funds are expended by the District for any contract resulting from this procurement process, Vendor certifies that it will comply with the record retention requirements detailed in 2 CFR § 200.334. Vendor further certifies that it will retain all records as required by 2 CFR § 200.334 for a period of three years after grantees or subgrantees submit final expenditure reports or quarterly or annual financial reports, as applicable, and all other pending matters are closed.

CERTIFICATION OF COMPLIANCE WITH THE ENERGY POLICY AND CONSERVATION ACT

When the District expends federal funds for any contract resulting from this procurement process, Vendor certifies that it will comply with the mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. 6321 et seq.; 49 C.F.R. Part 18).

CERTIFICATION OF EQUAL EMPLOYMENT STATEMENT

It is the policy of the District not to discriminate on the basis of race, color, national origin, gender, limited English proficiency or handicapping conditions in its programs. Vendor agrees not to discriminate against any employee or applicant for employment to be employed in the performance of this Contract, with respect to hire, tenure, terms, conditions and privileges of employment, or a matter directly or indirectly related to employment, because of age (except where based on a bona fide occupational qualification), sex (except where based on a bona fide occupational qualification) or race, color, religion, national origin, or ancestry. Vendor further agrees that every subcontract entered into for the performance of this Contract shall contain a provision requiring non-discrimination in employment herein specified, binding upon each subcontractor. Breach of this covenant may be regarded as a material breach of the Contract.

CERTIFICATION OF COMPLIANCE WITH BUY AMERICA PROVISIONS

[Only Applicable to Contracts funded under the National School Lunch Program] The Buy American regulations promulgated by USDA and TDA require public school districts to purchase domestically grown and processed food to the maximum extent practicable. The food product must consist of agricultural commodities that were grown domestically, unless an authorized exception exists and has been approved by the District.

CERTIFICATION OF ACCESS TO RECORDS – 2 C.F.R. § 200.336

Vendor agrees that the District's Inspector General or any of their duly authorized representatives shall have access to any books, documents, papers and records of Vendor that are directly pertinent to Vendor's discharge of its obligations under the Contract for the purpose of making audits, examinations, excerpts, and transcriptions. The right also includes timely and reasonable access to Vendor's personnel for the purpose of interview and discussion relating to such documents.

CERTIFICATION OF APPLICABILITY TO SUBCONTRACTRS

Vendor agrees that all contracts it awards pursuant to the Contract shall be bound by the foregoing terms and conditions.

VENDOR AGREES TO COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS, RULES, REGULATIONS, AND ORDINANCES. IT IS FURTHER ACKNOWLEDGED THAT VENDOR CERTIFIES COMPLIANCE WITH ALL PROVISIONS, LAWS, ACTS, REGULATIONS, ETC. AS SPECIFICALLY NOTED ABOVE.

Vendor's Name: _____

Address, City, State, and Zip Code: _____

Phone Number: _____ Fax Number: _____

Printed Name and Title of Authorized Representative: _____

Email Address: _____

Signature of Authorized Representative: _____

Date: _____

**GALENA PARK INDEPENDENT SCHOOL DISTRICT
 CERTIFICATION OF CRIMINAL HISTORY RECORD INFORMATION
 THIS FORM MUST BE COMPLETED BY ALL SERVICE PROVIDERS**

Section 1	<p>Vendor (Name): _____</p> <p>Contract Dates: _____ Drivers License Number: _____ Date of Birth: _____</p> <p>_____ Will employees, including you have continuing duties related to the proposal or contract named above or any other services performed at GPISD?</p> <p>Until further guidance is received, GPISD considers “continuing duties” to mean repetitive work duties rather than a onetime appearance or engagement.</p> <p>_____ Will those employees, including yourself, have direct contact with students?</p> <p>Direct contact with students is contact that results from activities that provide substantial opportunity for verbal or physical interaction with students and that is not supervised by a certified educator or other professional district employee. Examples include unsupervised coaching, tutoring, or other services to students. 19 Tex. Admin. Code § 153.1101(7).</p> <p style="text-align: center;">If either question is answered “no” vendor should complete section 2 of this form.</p> <p style="text-align: center;">If answer to both questions is “yes” vendor should complete section 3 of this form.</p>
Section 2	<p>I agree and understand employees of the company or individuals, including myself, who have not received the required criminal background check because the above description does not apply to them/myself will be considered visitors when on school campuses and must follow school district and campus policies related to visitors on school campuses.</p> <p>_____</p> <p style="display: flex; justify-content: space-between;"> Signature of Vendor Print Name Date </p>
Section 3	<p>As a result of revised DPS procedures related to access to national criminal history record information, only NCPA qualified school district contractors have access to national criminal history record information. Accordingly, non-NCPA qualified contractors must cooperate with the school district in facilitating criminal history reviews when the school performs the DPS FACT Clearinghouse review of criminal history record information in place of the school contractor. Accordingly, contractors must certify one of the following, depending on whether contractor is NCPA-qualified.</p> <p>_____ NCPA Qualified: The undersigned certifies that all employees, including myself, of the company that I own, operate, or manage, or myself as an independent contractor who have continuing duties related to the service to be performed on a GPISD campus and who also have direct contact with students have undergone the required criminal history background check or national criminal history record information review which may include fingerprints and photographs and that no prohibited contact as described herein was revealed.</p> <p style="text-align: center;">OR</p> <p>_____ Non-NCPA Qualified: The undersigned certifies that I have ensured that all employees, including myself, of the company that I own, operate, or manage, or myself as an independent contractor who have continuing duties related to the service to be performed on a GPISD campus and who also have direct contact with students have cooperated with GPISD in submitting all information necessary for GPISD to utilize its LEE Fast Pass procedure to perform the required criminal history background check or national criminal history record information review which may include fingerprints and photographs.</p> <p>_____</p> <p style="display: flex; justify-content: space-between;"> Signature of Vendor Print Name Date </p>

PAYROLL

(For Contractor's Optional Use; See Instructions at www.dol.gov/whd/forms/wh347instr.htm)



Rev. Dec. 2008

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

OMB No.: 1235-0008
Expires: 07/31/2024

NAME OF CONTRACTOR		OR SUBCONTRACTOR		ADDRESS																
PAYROLL NO.		FOR WEEK ENDING		PROJECT AND LOCATION								PROJECT OR CONTRACT NO.								
(1) NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	(2) NO. OF WITHHOLDING EXEMPTIONS	(3) WORK CLASSIFICATION	OT OR ST.	(4) DAY AND DATE							(5) TOTAL HOURS	(6) RATE OF PAY	(7) GROSS AMOUNT EARNED	(8) DEDUCTIONS					(9) NET WAGES PAID FOR WEEK	
				HOURS WORKED EACH DAY	FICA	WITH- HOLDING TAX	OTHER	TOTAL DEDUCTIONS												
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While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

Public Burden Statement

We estimate that it will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

Date _____

I, _____
(Name of Signatory Party) (Title)

do hereby state:

(1) That I pay or supervise the payment of the persons employed by

_____ on the _____
(Contractor or Subcontractor)

_____;
(Building or Work)

_____ day of _____, _____, and ending the _____ day of _____, _____,

all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said

_____ from the full _____
(Contractor or Subcontractor)

weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948, 63 Stat. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:

(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:

(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

— in addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

— Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

NAME AND TITLE	SIGNATURE
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THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 3729 OF TITLE 31 OF THE UNITED STATES CODE.

DAVIS-BACON PROJECTS

1. **PRIORITY OF ATTACHMENT.** The Parties agree that to the extent any provision in this Attachment conflicts with any other provision in the Contract Documents, the provisions herein shall control. The term "Contractor" as used herein shall refer to the prime contractor for the above Project.
2. **PREVAILING WAGE RATES.** As required by Chapter 2258 of the Texas Government Code Title 10 Prevailing Wage Rate, and Article 29, Section 5.5 of the Code of Federal Regulations (The Davis- Bacon Act and related provisions), no employee used in this construction may be paid less than the minimum prevailing wage applicable to the Project, as set forth in **Section R** to this Attachment. The applicability of prevailing wages shall not be construed to prohibit payment to laborers of more than the rates identified.
3. **MINIMUM WAGES.** All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof as **Section R** to this Attachment, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.
 - a. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section 3(c) of this Attachment; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in Sec. 5.5(a)(4) of the Davis-Bacon Act. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination and the Davis-Bacon poster shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.
 - b. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.
 - c. If the Contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in separate account assets for the meeting of obligations under the plan or program.
4. **WITHHOLDING.** The Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers

and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the federal agency may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

5. **PAYROLLS, REPORTING AND RECORDS.** Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.
6. **REPORTING.** The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the appropriate federal agency, if the federal agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the Owner. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site, and is attached hereto as **Section S** to this Attachment. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the appropriate federal agency, if the agency is a party to the Contract, but if the agency is not such a party, the Contractor will submit them to the applicant, sponsor, or Owner, as the case may be, for transmission to the any appropriate party, including the Wage and Hour Division of the Department of Labor, for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or Owner).
7. **STATEMENT OF COMPLIANCE.** Each payroll submitted shall be accompanied by a "Statement of Compliance, signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
 - a. That the payroll for the payroll period contains the information required to be provided under Sec. 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under Sec. 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

- b. That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;
 - c. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract;
 - d. The weekly submission of a properly executed certification set forth on the reverse side or second page of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by this Attachment;
 - e. The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.
- 8. RECORD KEEPING.** The contractor or subcontractor shall make all records required under this Attachment available for inspection, copying, or transcription by authorized representatives of the Owner or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal Agency may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.
- 9. APPRENTICES AND TRAINEES.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different

practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- a. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
- b. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

10. **COMPLIANCE WITH COPELAND ACT REQUIREMENTS.** The Contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.
11. **SUBCONTRACTS.** The Contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the Federal Agency may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.
12. **TERMINATION UNDER THIS SECTION.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.
13. **COMPLIANCE WITH DAVIS-BACON AND RELATED ACTS.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this Attachment.
14. **DISPUTES CONCERNING LABOR STANDARDS.** Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this Attachment shall not be subject to the general disputes clause of the Contract Documents. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

15. CERTIFICATION OF ELIGIBILITY. By entering into a contract with the Owner, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

- a. No part of the Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
- b. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

16. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

- a. **OVERTIME REQUIREMENTS.** No Contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- b. **VIOLATIONS, LIABILITY AND LIQUIDATED DAMAGES.** In the event of any violation of the clause set forth in Section 16 of this Attachment, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in this Section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in subsection (a) of this Section.
- c. **WITHHOLDING.** Withholding for unpaid wages and liquidated damages. The Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subsection (b) of this Section 16.

17. SUBCONTRACTS. The Contractor or subcontractors shall insert in any subcontracts the clauses set forth in Section 16 of this Attachment and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in Section 16 of this Attachment.

This Attachment is effective as of the date indicated on the Agreement between the Owner and the Contractor.

OWNER: Galena Park ISD

CONTRACTOR:

Signature: _____

Signature: _____

Print: _____

Print: _____

Title: _____

Title: _____



GALENA PARK INDEPENDENT SCHOOL DISTRICT

COMPETITIVE SEALED PROPOSALS

CSP # 22-204

Cimarron Elementary School HVAC Upgrades and Replacement

Project #: E130

Issued



STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR BUILDING CONSTRUCTION CONTRACTS

Agreement made as of _____, between the Board of Trustees of the Galena Park Independent School District, hereinafter called the Owner,

and the Contractor:

Contractor Name
Contractor Address

Project: Cimarron Elementary School HVAC Upgrades and Replacement
Address: 816 Cimarron St, Houston, TX 77015
Project #: E130

The Architect/Engineer is: Estes, McClure & Associates, Inc.
328 S. Broadway Ave., Tyler, TX 75702

The Contractor and the Owner for the consideration hereinafter named agree as follows:

ARTICLE 1. SCOPE OF WORK: The Contractor shall execute the entire Work described in the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others. The Contract Documents are listed below; these form the Contract and are as fully a part of the Contract as if attached to this Agreement or repeated herein. 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 Documents, in order of priority, are:

This Agreement (Standard Form of Agreement Between Owner and Contractor, as may be amended by duly executed and authorized Change Orders)

Uniform General Conditions of the Contract for Construction – Consisting of 26 Pages, as modified by the:

Supplementary Conditions of the Contract for Construction – Consisting of 3 Page(s)

Special Conditions of the Contract for Construction – Consisting of 2 Page(s)

Project Manual per Attachment “A” – Consisting of Page(s)

Drawing List per Attachment “B” – Consisting of Page(s)

Addendum #1 – Dated _____ – Consisting of Page(s)

Addendum #2 – Dated _____ – Consisting of Page(s)

Addendum #3 (Davis-Bacon Addendum) – Dated _____ – Consisting of Page(s)

Appendix 1 to Addendum #3 (Davis-Bacon Prevailing Wages) – Dated _____ – Consisting of Page(s)

Alternates: The following Alternates, fully described in the Contract Documents, are included as a part of this Contract:

(ACCEPTED ALTERNATES WILL BE LISTED HERE)

Unit Prices: The following Unit Prices, fully described in the Contract Documents, are included as a part of this Contract:

(UNIT PRICES WILL BE LISTED HERE)

ARTICLE 2. TIME OF COMPLETION: The Work to be performed under this Contract shall be commenced within ten (10) days from the date of the Notice to Proceed issued by the Owner; and the Contractor shall achieve Substantial Completion within the time stipulated in the Supplementary Conditions of the Contract, subject to

adjustments of this Contract Time as provided elsewhere in the Contract Documents. The time set forth for completion of the Work is an essential element of the Contract.

ARTICLE 3. THE CONTRACT SUM: The Owner shall pay the Contractor for performance of the Contract, subject to additions and deductions provided therein, the sum of _____ DOLLARS (\$ _____), and make payments on account as provided elsewhere in the Contract Documents.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement as of the day and year first written above.

ATTEST: (Notary Seal)

CONTRACTOR
Contractor Name

By:

By: _____
(original signature)

(notary signature)

(name and title printed)

(notary name printed) (notary expiration date)

GALENA PARK INDEPENDENT SCHOOL DISTRICT

CERTIFICATE OF APPROVAL

By:

I hereby certify that pursuant to procedures authorized by the Board of Trustees of the Galena Park Independent School District, the foregoing Agreement was approved the ## day of MMM in the year 2019, and that the person whose signature appears above is authorized to execute such Agreement on behalf of the Board.

(original signature)

(Print name)

Title

INSTRUCTIONS FOR PERFORMANCE AND PAYMENT BONDS

1. The name, including full legal name, and business or residence address of each individual party to the bond shall be inserted in the space provided therefore, and each such party shall sign the bond with his/her usual signature on the line opposite his/her seal.
2. If the Principals are partners, their individual names shall appear in the space provided therefore, with the recital that they are partners composing a firm, naming it, and all the members of the firm shall execute the bond as individuals and as co-partners.
3. If the Principal or Surety is a corporation, the name of the state in which incorporated shall be inserted in the space provided therefore, and said instrument shall be executed and attested under the corporate seal as indicated in the form. If the Corporation has no corporate seal, the fact shall be stated, in which case a scroll of adhesive seal shall appear following the corporate name.
4. The official character and authority of the person or persons executing the bond of the Principal, if a corporation, shall be certified by the Secretary or Assistant Secretary, according to the form herein provided. In lieu of such certificate there may be attached to the bond copies of so much of the records of the corporation as will show the official character and authority of the officer signing, duly certified by the Secretary or Assistant Secretary, under the corporate seal, to be true copies.

THE DATE OF THE BOND MUST NOT BE PRIOR TO THE DATE OF THE STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR.

PERFORMANCE BOND FOR BUILDING CONSTRUCTION CONTRACTS

SURETY BOND NO. _____

STATE OF TEXAS _____

COUNTY OF _____

KNOW ALL PERSONS BY THESE PRESENTS: That we,

Contractor Name
Contractor Address

as Principal, hereinafter called Contractor, and
(Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto the Galena Park Independent School District as Obligee, hereinafter called the Owner, in the amount of

_____ Dollars

(\$ _____),
for payment whereof, the said Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that whereas the principal has by written agreement dated the **## day of MMM in the year 2019**, entered into a contract with the Owner for

Project: Cimarron Elementary School HVAC Upgrades and Replacement
Address: 816 Cimarron St, Houston, TX 77015
Project #: E130

in accordance with the Contract Documents prepared by

The Architect/Engineer is: Estes, McClure & Associates, Inc.
328 S. Broadway Ave., Tyler, TX 75702

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW THEREFORE, the condition of this obligation is such that, if the Contractor shall faithfully perform the Contract in accordance with the Contract Documents, and shall fully indemnify and save harmless the Owner from all cost and damage which the Owner may suffer by reason of the Contractor's default or failure so to do and shall fully reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government code as amended and all liabilities on this bond shall be determined in accordance with the provisions of said Chapter to the same extent as if it were copied at length herein.

In the event the Contractor is declared in default under the Contract, Surety will within Fifteen (15) days of the Owner's declaration of such default take over and assume completion of said Contract and become entitled to the payment of the balance of the Contract Sum. Conditioned upon the Surety's faithful performance of its obligations, the liability of the Surety for the Contractor's default shall not exceed the penalty of this bond.

The Surety agrees to pay to the Owner upon demand all loss and expense, including attorney's fee, incurred by the Owner by reason of or on account of any breach of this agreement by Surety.

Provided further, that if any legal action be filed upon this bond, venue shall lie in Harris County, State of Texas.

IN WITNESS WHEREOF, the above bonded parties have executed this instrument under their several seals this

_____ day of _____ in the year 20_____, the name and corporate seals of each corporate party being hereto affixed, and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

ATTEST: (Notary Seal) By: _____ (notary signature) _____ (notary name printed)	PRINCIPAL By: _____ (original signature) _____ (name and title printed)
--	---

SURETY'S

By: _____
 (original signature)

 (name and title printed)

SURETY HOME OFFICE SERVICING AGENT

 (name)

 (title)

 (address)

 (Telephone)

CERTIFICATION AS TO CORPORATE PRINCIPAL

I, _____, certify that
I am the _____ secretary of the Corporation named as Principal in
the within bond; that _____, who signed the said bond on behalf
of the Principal, was then _____ of said corporation; that I know
that person's signature thereon to be genuine; and that said bond was duly signed, sealed and attested for and in
behalf of said Corporation by authority of its governing body.

(CORPORATE SEAL)

SAMPLE

PAYMENT BOND FOR BUILDING CONSTRUCTION CONTRACTS

SURETY BOND NO. _____

STATE OF TEXAS _____

COUNTY OF _____

KNOW ALL PERSONS BY THESE PRESENTS: That we

Contractor Name

Contractor Address

as Principal, hereinafter called Contractor, and (Here insert full name and address or legal title of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto the Galena Park Independent School District as Obligee, hereinafter called the Owner, in the amount of

_____ Dollars

(\$ _____),
for payment whereof, the said Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that whereas the principal has by written agreement dated the **## day of MMM in the year 2019**, entered into a contract with the Owner for

Project: Cimarron Elementary School HVAC Upgrades and Replacement
Address: 816 Cimarron St, Houston, TX 77015
Project #: E130

in accordance with the Contract Documents prepared by

The Architect/Engineer is: Estes, McClure & Associates, Inc.
328 S. Broadway Ave., Tyler, TX 75702

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.
NOW THEREFORE, the condition of this obligation is such that, if the Contractor shall promptly make payments to all claimants as defined in Chapter 2253 of the Texas Government Code as amended, of all persons supplying labor and materials in the prosecution of the work provided for in said Contract, then this obligation shall be null and void, but otherwise it shall remain in full force and effect. In the event Contractor fails to promptly pay when due persons who have supplied labor, materials, or supplies used in the performance of the said Contract, Surety will, upon receipt of notice from the Owner or a claim in the form required by law, satisfy all undisputed balances due, and make arrangements satisfactory to the interested parties to resolve all amounts disputed in good faith, but

in no event shall the liability of the Surety for the Contractor's failure to promptly pay for labor, materials, or supplies exceed the penalty of this bond.

The Surety agrees to pay to the Owner upon demand all loss and expense, including attorney's fee, incurred by the Owner by reason of or on account of any breach of this agreement by Surety.

Provided further, this bond is made and entered into for the protection of all claimants supplying labor and material in the prosecution of the work provided for in said Contract, and all such claimants shall have a direct right of action under the bond as provided in Chapter 2253 of the Texas Government Code as amended and all liabilities on this bond shall be determined in accordance with the provisions of said chapter to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals this

_____ day of _____ in the year 20 _____, the name and corporate seals of each corporate party being hereto affixed, and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

ATTEST: (Notary Seal) By: _____ (notary signature) _____ (notary name printed)	PRINCIPAL By: _____ (original signature) _____ (name and title printed)
--	---

SURETY'S

By: _____
 (original signature)

 (name and title printed)

SURETY HOME OFFICE SERVICING AGENT

 (name)

 (title)

 (address)

 (Telephone)

CERTIFICATION AS TO CORPORATE PRINCIPAL

I, _____, certify that
I am the _____ secretary of the Corporation named as Principal within the
Performance & Payment bond; that _____, who signed the said
bond on behalf of the Principal, was then _____ of said corporation;
that I know that person's signature thereon to be genuine; and that said bond was duly signed, sealed and attested
for and in behalf of said Corporation by authority of its governing body.

(CORPORATE SEAL)

SAMPLE

CA - GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

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ARTICLE 6 CONTRACT CHANGES

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6.2	Unit Prices
6.3	Claims for Additional Costs
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ARTICLE 8 CONTRACT COMPLETION TIME

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8.2	Construction Schedule
8.3	Delays and Extension of Time
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ARTICLE 9 CONTRACT SUBSTANTIAL COMPLETION

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9.2	Date of Substantial Completion
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ARTICLE 10 CONTRACT FINAL ACCEPTANCE AND PAYMENT

10.1	Notification
10.2	Final Payment Documentation
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ARTICLE 11 CONTRACT CORRECTION PERIOD

11.1	One Year Contract Correction Period
11.2	Remedy of Defects Under Warranty

ARTICLE 12 OPERATION AND STORAGE AREAS

12.1	Contractor's Use of Premises
12.2	Contractor's Maintenance of Premises

ARTICLE 1

CONTRACT DEFINITIONS

Whenever the following terms are used in these General Conditions or in the other Contract Documents the intent and meaning shall be interpreted as follows:

1.1 Contract Documents: The Contract Documents consist of the Advertisement for Sealed Proposals, Instructions to Proposers, Proposal Security, Proposal Form, Felony Conviction Notice, Affidavit of Non-collusion, Certificate of Residency, fully executed Owner-Contractor Agreement, Performance Bond, Payment Bond, the Conditions of the Contract (General, Supplementary, Special and other Conditions), the Project Manual, the Drawings, Pre-Proposal Meeting Minutes, all Addenda issued prior to execution of the Contract, other documents listed in the Owner-Contractor Agreement, and all Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by the Owner and the Contractor, (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.

1.1.1 The Contract Documents form the Contract, which represents the entire and integrated agreement between the Owner and the Contractor and supersedes all prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect and the Contractor, (2) between the Owner and a Subcontractor or Sub-subcontractor, (3) between the Owner and Architect or (4) between any person or entities other than the Owner and the Contractor.

1.1.2 The Contract Documents are complementary, and what is required by any one document shall be as binding as if required by all.

1.2 Owner: The Board of Trustees of the Galena Park Independent School District, who shall execute this Contract in the name of the School District, and who, along with certain designated administrative employees, shall be responsible for the administration of the Contract.

1.3 Architect/Engineer: An Architect registered in accordance with Occupation Code, Title 6, Chapter 1051 and/ or a professional Engineer, in accordance with Occupations Code 1001.057. Contract Documents by the Architect are limited in authority and responsibility as defined in the General Conditions.

1.4 Contractor: The individual, corporation, company, partnership, firm or other organization that has contracted to perform the Work under the Contract with the Owner.

1.5 Subcontractor: A person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. There shall be no direct contractual relationship between the Owner and any Subcontractor.

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

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

1.8 Day: A calendar day beginning and ending at 12:00 midnight, unless otherwise specifically stipulated.

1.9 Contract Sum: The total compensation payable to the Contractor for performing the Work as originally contracted for, or as subsequently adjusted by Change Order or other Contract Modification.

1.10 Substantial Completion: Jointly certified by the Architect/Engineer, Owner and Contractor as the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents, and approvals from regulatory agencies have been received, so that the Owner can occupy or utilize the Work or the designated portion thereof for its intended use. This includes a fully-operational HVAC system with controls, security system, fire alarm system and PA system.

1.11 Pre-Final Inspection: The inspection conducted to determine that a Project or a portion thereof, is substantially complete.

1.12 Final Inspection: The inspection conducted to determine that all deficiencies found in the Pre-Final Inspection, or subsequently discovered, have been corrected and that it is appropriate to release retainage and/or make final payment.

1.13 Contract Time: Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, from the Notice to Proceed to Substantial Completion.

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

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

1.16 The Project Manual: A volume assembled for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

1.17 Sub-subcontractor: A person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site.

ARTICLE 2

LAWS GOVERNING CONSTRUCTION

2.1 Compliance with Laws: In the performance of the Work, the Contractor shall comply with all applicable State and Federal laws including, but not limited to, laws concerned with labor, equal employment opportunity, safety, criminal history review, and minimum wages. The Contractor shall become familiar with, and at all times shall comply with and give notices required by all Federal, State and Local laws, ordinances, rules, regulations and lawful orders of public authorities which in any manner affect the performance of the Work, and shall indemnify and save harmless the Owner and its official representatives against any claim arising from violation of any such law, ordinance or regulation by the Contractor or by the Contractor's Subcontractors or employees. When requested, competent evidence of compliance with applicable laws shall be furnished.

2.1.1 The Contractor shall cooperate with city or other governmental officials at all times where their jurisdiction prevails. The Contractor shall secure and pay for all permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required when proposals are received or negotiations are concluded.

2.1.2 Where the Underwriters' Laboratories have established standards and issued labels for a particular group, class, or type of equipment the Underwriters'

Laboratories label shall be required on all equipment in that category.

2.1.3 These Contract Documents shall be governed and interpreted in accordance with the laws of the State of Texas, and shall be performable in Harris County, Texas.

2.2 Wage Rates: The Contractor is required to pay not less than the wage scale of the various classes of labor as shown on the "Prevailing Wage Rate Schedule" in the Supplementary Conditions to the General Conditions of the Contract provided by the Owner. The specified wage rates are minimum rates only, and the Owner will not consider any claims for additional compensation made by any Contractor because of payment by the Contractor of any wage rates in excess of the applicable minimum rate contained in the Contract Documents.

2.2.1 Pursuant to the provisions of Chapter 2258 of the Texas Government Code, the Contractor shall forfeit as a penalty to the Galena Park Independent School District sixty dollars (\$60.00) for each laborer, workman or mechanic employed, for each calendar day, or portion thereof, such laborer, workman or mechanic is paid less than the stipulated minimum rates for any Work done under the Contract by the Contractor or by a Subcontractor or Sub-subcontractor under the Contractor.

2.2.2 The Contractor is responsible for compliance with the prevailing wage laws in accordance with the Owner's Prevailing Wage Rate Schedule and associated Standard Job Classifications. The Owner reserves the right to conduct on-site interviews with construction workers in order to verify compliance.

2.2.3 All workers shall be classified in one of the job classifications in the Prevailing Wage Rate Schedule. The Contractor shall notify each worker commencing work on the Project of the worker's job classification and the established wage rate required to be paid. The notice must be delivered in writing to the employee, with copies to the Owner, and must list both monetary wages and fringe benefits to be paid for each classification in which the worker is assigned duties.

2.2.4 Competent evidence of compliance with the applicable laws and the Owner's Prevailing Wage Rate Schedule shall be furnished by the Contractor in the form of certified payroll reports submitted monthly in a form acceptable to the Owner.

2.2.5 The Contractor shall post the Prevailing Wage Rate Schedule at the Project construction site in a conspicuous location and maintain the posting throughout the construction period to ensure that all workers have access to wage rate information.

2.3 State Sales and Use Taxes: The Owner qualifies for exemption from state and local sales and use taxes pursuant to the provisions of the Texas Limited Sales, Excise and Use Tax Act (Taxation - General, Article 20.04, Vernon's Texas Civil Statutes). The Contractor shall claim exemption from payment of applicable State taxes by complying with such procedures as may be prescribed by the State Comptroller of Public Accounts. The Owner shall forward an executed copy of the GPISD Tax Exemption Certificate with the fully executed Owner/Contractor Agreement.

2.4 Antitrust Claims: The Contractor shall assign to the Owner any and all claims for overcharges associated with this Contract which arise under the antitrust laws of the United States, 15 U.S.C.A. Secs. 1 et seq (1973).

ARTICLE 3

CONTRACT DOCUMENTS AND BONDS

3.1 Copies Furnished: Drawings and the Project Manual: Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of the Drawings and the Project Manual as are reasonably necessary for execution of the Work.

3.2 Ownership of Contract Documents: All Contract Documents and copies thereof furnished by the Owner are and shall remain property of the Owner. In making copies of the Documents available the Owner does so only for the purpose of prosecution of the Work and does not confer a license or grant permission for any other use of the Documents. They are not to be used on any other Project and, with the exception of one Contract set for each party to the Contract, are to be returned to the Owner upon request following completion of the Work.

3.3 Contract Documents at the Site: The Contractor shall maintain in good order at the site one complete copy of all Contract Documents including Drawings, Project Manual, Addenda, Change Orders and other Contract Modifications, as well as a complete file of reviewed shop drawings and other technical submittals. The Contractor shall at all times give the Owner or its representatives and agents access thereto.

3.4 Record Documents: The Owner shall furnish to Contractor one set of "Xerox" Construction Drawings for the purpose of Record Documents. The Contractor shall maintain Record Documents and technical submittals (including shop drawings) which are marked to reflect the as-constructed conditions and representations of the Work performed, whether it be directed by Addendum, Change Order or other Contract Modifications. The as-constructed Record Documents and technical submittals shall also

record accurately and dimensionally the locations of concealed elements of construction which are not specifically and dimensionally located in the original Contract Documents, particularly piping and equipment for utility, mechanical, electrical, plumbing and special systems. All records prescribed herein shall be made available for reference and examination by the Owner and its representatives and agents. The Contractor shall update the as-constructed Record Documents monthly prior to submission of periodic Applications for Payment. Failure to maintain such records shall constitute cause for denial of an Application for Payment otherwise due. Prior to the date of Substantial Completion, the Contractor shall deliver to the Architect/Engineer one complete set of as-constructed Record Documents which the Architect/Engineer shall review and (if found acceptable) shall then use in preparing final electronic Record Documents for the Owner.

3.5 Performance and Payment Bonds: Performance and Payment Bonds are not required on contracts of less than \$25,000.00. If the total Contract Sum equals or exceeds \$25,000.00, then the Contractor shall execute (in accordance with the provisions of Section 2253.021 of the Government Code) the following bonds to the Owner: (1) Performance Bond in the amount of the total Contract Sum conditioned upon the faithful performance of the Contract. Said bond shall be solely for the protection of the Owner. (2) Payment Bond in the amount of the total Contract Sum solely for the protection of those supplying labor, materials and/or equipment in the prosecution of the Contract. Additional requirements and instructions for preparation and submittal of Performance and Payment Bonds may be stipulated elsewhere in the Contract Documents.

3.5.1 Each bond shall be executed by a corporate surety or corporate sureties duly authorized to do business in the State of Texas, acceptable to the Owner, and on forms provided by the Owner. If any surety upon any bond furnished in connection with the Contract becomes insolvent, or otherwise not authorized to do business in this State, then the Contractor shall promptly furnish equivalent security to protect the interests of the Owner and of persons supplying labor, materials, and/or equipment in the prosecution of the Work contemplated by the Contract.

3.5.2 Each bond shall be accompanied by a valid Power-of-Attorney (issued by the surety company and attached, signed and sealed with the corporate embossed seal) authorizing the agent who signs the bond to commit the company to the terms of the bond, and stating (on the face of the Power-of-Attorney) the limit, if any, in the total amount for which the agent is empowered to issue a single bond.

3.6 Interrelation of Contract Documents: The interrelation of the Drawings and the Project Manual is as follows: The Project Manual establishes standards of design, quality, function and performance of several materials; the Drawings establish the locations, quantities, dimensions and details. Anything mentioned in the Project Manual and not shown on the Drawings, or shown on the Drawings and not mentioned in the Project Manual, shall be of like effect as if shown or mentioned on both.

3.6.1 Should the Drawings disagree one with another, or with the Project Manual, the better quality or greater quantity of Work or materials shall be performed or furnished. Figures and measurements given on larger scale drawings shall govern smaller scale drawings. In case of discrepancy either in the figures, in the Drawings, or in the Project Manual, the matter shall be promptly submitted in writing by the Contractor to the Architect/Engineer with a copy to the Owner. The Architect/Engineer shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at the Contractor's own risk and expense.

3.6.2 Any "Scope of Work" or "Work Included" statement placed in a Section of the Project Manual is intended to designate in general terms the types of Work to be performed. It is not intended to limit or to define the extent of the Work.

3.6.3 The location or grouping of Drawings and the placement of the Project Manual into Divisions and Sections is only for the convenience of referencing and relating like or similar types of Work. It is not intended to establish trade jurisdictions or to define or limit Work to be subcontracted. The prosecution and completion of all Work required by the Contract Documents is the responsibility of the Contractor.

3.7 Tax ID Form: Contractor shall provide to the Owner a copy of the executed notification of Tax ID Form W-9 prior to submitting the first Application for Payment.

ARTICLE 4

CONTRACT ADMINISTRATION

4.1 General Administration: Unless otherwise provided for in the Contract Documents, the Architect/Engineer will provide general administration of the Contract and will be the Owner's representative during construction and until final payment.

4.1.1 The Owner assumes no responsibility for any understanding given or representation made orally by its agents prior to the execution of this Contract, unless such understanding or representation is expressly stated in the Contract. The Owner assumes no responsibility for any

conclusions or interpretations made by the Contractor. Any failure by the Contractor to become acquainted with available information will not relieve the Contractor from responsibility for properly estimating the difficulty or cost of successfully performing the Work or mutually agreed changes thereto.

4.1.2 The Architect/Engineer has the authority to act on behalf of the Owner to the extent provided for in the Contract Documents, unless otherwise modified by written instrument which will be shown to the Contractor. The Architect/Engineer will advise and consult with the Owner.

4.1.3 The Owner's written instructions to the Contractor will generally be issued through the Architect/Engineer, except that the Owner reserves the right on appropriate occasions to issue instructions directly to the Contractor or through other designated representatives. All written communications concerned with the construction of the Project shall be furnished to the Owner, the Owner's designated agents and representatives, the Architect/Engineer, and the Contractor by the party originating the communication. All oral messages to or from the Contractor shall be given through the Owner's designated representative. The Contractor is responsible for complying with the Owner's administrative requirements set forth in these General Conditions and stated elsewhere in the Contract Documents.

4.1.4 All oral instructions affecting Contract Sum, Contract Time or Contract interpretation, shall be confirmed promptly in writing with copies furnished to the Architect/Engineer, the Owner's designated representatives, and the Contractor by the party issuing the instruction.

4.1.5 No instructions affecting the Architect/Engineer's design liability shall be issued without the Architect/Engineer's prior written consent.

4.1.6 The Owner's representative, and the Architect/Engineer with the Owner's consent, shall interpret the Contract requirements and have the authority to reject Work performed by the Contractor, which in the opinion of the Owner's representative or the Architect /Engineer does not meet the requirements of the Contract and to order such Work removed and replaced in accordance with paragraph 5. 11.

4.2 Subcontracts: The Contractor agrees to bind every Subcontractor and every Subcontractor agrees to be bound by the terms, conditions and requirements of the Contract Documents. Further, the Contractor shall fully inform all Subcontractors prior to executing an agreement with them that they will be required to perform their Work in conformance with the Contract Documents, and to submit

cost estimates and change proposal requests in complete and full analytical detail per Paragraph 6.7.

4.2.1 The Contractor shall defend, indemnify and save harmless the Owner for any Subcontractor's claim which may result from the failure of the Contractor to incorporate the provisions of this Contract into any of the Contractor's subcontracts.

4.2.2 After the execution of the Contract, a change in any accepted Subcontractor or the addition of any new Subcontractor can only be made with the written consent of the Owner.

4.2.3 Re: Pre-Approved Sub-Contractors per the Supplementary Conditions.

4.3 Access to and Inspection of the Work: The Contractor shall provide sufficient, safe and proper facilities at all reasonable times for observation and/or inspection of the Work by authorized representatives of the Owner. The Architect/Engineer and the Owner will make periodic visits to the site to familiarize themselves with the progress and quality of the Work and to determine if the Work is proceeding in accordance with the Contract Documents. The presence of the Owner or his representative at the Project site does not imply concurrence with or approval of the Work.

4.4 Separate Contracts: The Owner reserves the right to award other Contracts in connection with other portions of the Project under these or similar conditions of the Contract.

4.4.1 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who signs each separate Owner-Contractor Agreement. The Contractor for this Contract shall properly connect and coordinate the Work of this Contract with the Work of other Contractors. If any part of this Contractor's Work depends on proper execution or proper results on the Work of any other separate Contractor, this Contractor shall inspect and promptly report in writing to the Architect/Engineer any discrepancies or defects which the Contractor may find in such other Work that render it unsuitable for such proper execution or results. Failure of this Contractor to so inspect and report shall constitute an acceptance of the other Contractor's Work as fit and proper to receive the Work of this Contract, except as to defects which may develop in the other separate Contractor's Work after the execution of this Contractor's Work.

4.4.2 Should this Contractor cause delay or cause damage to the Work or property of any separate Contractor

on the Project, this Contractor shall, upon due notice, endeavor to settle with such other Contractor by agreement. If such separate Contractor sues the Owner on account of any damage alleged to have been so sustained, then the Owner shall notify this Contractor who shall defend such proceedings and pay all costs in connection therewith and, if any judgment against the Owner arises there from, this Contractor shall pay or satisfy it.

4.4.3 This Contractor shall afford the Owner and/or other contractors reasonable opportunity for the introduction and storage of their materials and equipment, and for the execution of their Work, and for proper connection to and coordination with this Contractor's Work.

4.4.4 The Owner reserves the right to make essential installations which are pertinent to the use of the building or Project prior to Substantial Completion. Within this right the Owner may let other Contracts or may do such Work with its own labor forces and materials. The Contractor shall not commit or permit any act which will interfere with the performance of Work by any other Contractor or supplier, or by Owner's employees. The Contractor shall cooperate to the end that the Owner may realize complete functioning of the building or Project on the day of Substantial Completion.

4.5 Contract Termination:

4.5.1 Termination by Contractor. If the Work is stopped for a period of ninety (90) days under an order of any court or other public authority having jurisdiction, or as a result of an act of government, such as a declaration of a national emergency making materials unavailable, through no act of fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the Work under a Contract with the Contractor, then the Contractor may, upon ten (10) additional days written notice to the Owner and the Architect/Engineer, terminate the Contract and recover from the Owner payment for all Work executed and for any loss sustained upon any materials, equipment, tools, construction equipment and machinery, including reasonable profit and overhead associated with such Work for losses and reasonable expenses resulting from such termination. If the cause of the Work stoppage is removed prior to the end of the ten (10) day notice period, the Contractor may not terminate the Contract.

4.5.2 Termination by Owner. If the Owner determines that the Contractor is adjudged as bankrupt, or if the Contractor makes a general assignment for the benefit of the Contractor's creditors, or if a receiver is appointed on account of the Contractor's insolvency, or if the Contractor persistently or repeatedly refuses or fails (except in cases for which extension of time is provided) to supply enough properly skilled workmen or proper materials, or if the Contractor persistently performs substandard Work, or

persistently disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, or is otherwise guilty of a substantial violation of a provision of the Contract Documents, or fails to so prosecute the Work as to insure its completion (within the time, or any extension thereof, specified in this Contract), then the Owner may, without prejudice to any right or remedy, and after giving the Contractor and the Contractor's surety (if any) ten (10) days written notice, terminate the employment of the Contractor and take possession of the site and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor. Should the surety fail to respond within fifteen (15) days following such notice and to pursue completion of the Work with diligence acceptable to the Owner, the Owner may arrange for completion of the Work and deduct the cost thereof from the unpaid balance of the Contract Sum, including the cost of additional Architect/Engineer services and Owner Contract administration costs made necessary by such default or neglect, in which event no further payment shall then be made by the Owner until all costs of completing the Work shall have been paid. If the unpaid balance of the Contract Sum exceeds the costs of finishing the Work, including compensation for the

Architect/Engineer's additional services made necessary thereby, then such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, then the Contractor or the Contractor's surety shall pay the difference to the Owner. If the Owner sues the Contractor or Surety on account of failure to pay such difference in cost upon demand, then the Contractor and Surety will pay all costs in connection therewith, including reasonable attorney's fees. This obligation for payment shall survive the termination of the Contract.

4.5.3 Termination for Convenience of Owner: Prior to or during the performance of the Work, the Owner reserves the right to terminate the Contract for convenience or unforeseen causes that may occur. Upon such occurrence, the following procedures will be adhered to:

4.5.3.1 The Owner will immediately notify the Architect/Engineer and the Contractor in writing, specifying the effective termination date of the Contract.

4.5.3.2 After receipt of the notice of termination, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due at that point in the Contract.

- .1 Stop all Work.
- .2 Place no further subcontracts or orders for materials or services.
- .3 Terminate all existing subcontracts.
- .4 Cancel all existing materials and equipment orders as applicable.

.5 Take all actions necessary to protect and preserve all property related to this Contract which is in the possession of the Contractor.

4.5.3.3 Within 180 days of the date of the notice of termination, the Contractor shall submit a final termination settlement proposal to the Owner based upon costs up to the date of termination, reasonable profit on Work done only, and reasonable demobilization costs. If the Contractor fails to submit the proposal within the time allowed, then the Owner may determine the settlement amount, and shall pay the determined amount to the Contractor.

4.5.3.4 If the Contractor and the Owner fail to agree on the settlement amount, then the matter will be handled as a dispute in accordance with the procedure described in Subparagraph 5.2.1.

4.6 Written Notice: Written notice shall be considered to have been duly given if delivered in person to the individual or member of the firm or to an officer of the corporation for whom it is intended, or if delivered to, or sent by registered or certified mail to, the last business address known to the one who gives the notice.

4.7 Disputed Matters: Disputed matters shall be handled through administrative procedures as established in Subparagraph 5.2.1.

ARTICLE 5

CONTRACT RESPONSIBILITIES

5.1 Owner's Responsibilities: The Owner shall furnish all surveys describing the physical characteristics, legal description and limitations, site utility locations and other information necessary to the Contractor which are under the Owner's control.

5.1.1 Communication with the Contractor shall be in accordance with Paragraph 4.1.

5.1.2 Necessary actions of the Owner, including processing of payments to the Contractor, shall be accomplished with reasonable promptness and subject to Government Code, Chapter 2251, Subchapter B.

5.2 Owner-Contractor Obligations: The Owner and the Contractor each bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. The Contractor shall not assign the Contract or sublet it as a whole without the written consent of the Owner, nor shall the Contractor assign any moneys

due, or to become due hereunder, without the previous written consent of the Owner.

5.2.1 Disputes: Except as otherwise provided in this Contract, any dispute concerning a question of fact arising under this Contract, which is not disposed of by the Owner-Contractor Agreement, shall be decided by the Owner (as represented by the Assistant Superintendent for Support Services) who shall reduce a decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Owner shall be final and conclusive unless, within 30 days from the date of receipt of such written decision, the Contractor mails or otherwise furnishes to the Owner a written appeal addressed to the Superintendent, Galena Park Independent School District. If the decision on the appeal is adverse, then the Contractor may, within 30 days from the receipt of such decision, make further appeal to the Board of Trustees of the Galena Park Independent School District whose decision shall be final and conclusive. In connection with any appeal under this Subparagraph, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of the Contractor's appeal to a person or persons appointed by the Board of Trustees for such purpose. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the Contract and in accordance with the Owner's decision. Both parties agree that any decision of fact reached by the process in this Subparagraph 5.2.1 shall be contractually binding upon them and shall become a part of this Contract.

5.3 Contractor's Responsibilities: The Contractor shall supervise, coordinate and direct the Work using the Contractor's best skill and attention to assure that each element of the Work conforms to the requirements of the Contract Documents. The Contractor shall be solely responsible for and have control over all construction means, methods, techniques, safety, sequences and procedures, and for coordinating all portions of the Work under the Contract.

5.3.1 The Contractor is obligated to notify the Architect/Engineer, in writing, when 1) the Contractor is in disagreement with any items, details, methods, or specifications, or 2) if the Contractor has reason and can provide evidence that an element of the Work will not function properly or safely, or will not deliver appropriate service and durability if such item is provided in accordance with the Contract Documents. Such matters will be clarified in writing by the Architect/Engineer prior to their incorporation into the Project.

5.3.2 The Contractor's Superintendent shall prepare daily reports indicating all work in progress, listing all Subcontractors and crews working on site, and listing all material and equipment delivered to site. Provide copies of daily reports to Owner at progress meetings.

5.4 Contractor's Superintendent: The Contractor shall employ a competent Superintendent and necessary assistants who shall be in attendance at the Project site from the Notice to Proceed to completion of all punch list items attached to the Certificate of Substantial Completion. The Superintendent shall not be a foreman working on the Project; shall be an individual satisfactory to the Owner; and shall not be changed without the written approval of the Owner (except if the Superintendent leaves the employment of the Contractor). The Superintendent shall represent the Contractor and shall have full authority to act on the Contractor's behalf. All communications given to the Superintendent shall be as binding as if given to the Contractor.

5.5 Acts and Omissions: The Contractor shall be responsible for acts and omissions of the Contractor's employees, of the Contractor's Subcontractors, their agents and employees and of other persons or entities performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors. The Owner may, in writing, require the Contractor to remove from the Work any employee that the Owner's designated representative or agent finds careless, incompetent or otherwise objectionable.

5.6 Conditions at Site or Building: The Owner makes no representations as to the accuracy or completeness of the site information furnished to the Contractor by Owner; does not expressly or impliedly warrant same; and is not responsible for any interpretations or conclusions reached by the Contractor with respect thereto. It is the Contractor's sole responsibility to verify (to the Contractor's own satisfaction) all site information including, but not restricted to, topographical data, borings, subsurface information, utilities and easements.

5.6.1 The Contractor is responsible for having visited the site and having ascertained pertinent local conditions such as locations, accessibility, and general character of the site or building, the character and extent of existing Work within and adjacent to the site, and any other Work being performed thereon. Any failure to do so will not relieve the Contractor from responsibility for successfully performing the Work without additional expense to the Owner.

5.6.2 If, in the performance of the Contract, concealed, subsurface or latent conditions at the site are found to be materially different from the information included in the proposed Contract Documents; or if unknown conditions of an unusual nature are discovered which differ materially from the conditions usually inherent in Work of the character shown and specified, then the Architect/Engineer shall be notified in writing of such conditions before they are disturbed. Upon such notice, or upon the Architect/Engineer's own observation of such conditions,

the Architect/Engineer, with the approval of the Owner, will promptly make such changes in the Contract Documents as the Architect/Engineer deems necessary to conform to the different conditions. Any increase or decrease in the cost of the Work or in the time within which the Work is to be completed, resulting from such changes will be adjusted by Change Order, subject to the prior approval of the Owner.

5.7 Insurance

5.7.1 The Contractor shall not commence any portion of the Work under this Contract until the Contractor has obtained all the insurance required hereunder and Certificates of Insurance and Policy have been filed with and reviewed by the Owner. Acceptance of the insurance certificates by the Owner shall not relieve or decrease the liability of the Contractor.

- .1 This section shall govern the entire Contract.
- .2 The insurance shall contain a provision that at least thirty days prior written notice shall be given to the Owner in the event of cancellation, material change or non-renewal.
- .3 Insurance shall be underwritten by a company rated not less than B + VII in Best's latest published guide.
- .4 There shall be a hold harmless agreement in which the Contractor assumes liability on the Contract and holds the School District harmless.
- .5 The Contractor shall purchase and maintain in force the following kinds of insurance and bonds for operations under construction contracts and as specified in each section.

5.7.2 Casualty Insurance - Unless otherwise provided for in the Supplementary Conditions, the Contractor shall provide and maintain (until the Work covered in this Contract is completed and accepted by the Owner) the minimum insurance coverages as follows:

- .1 Workmen's Compensation shall be furnished for all employees as follows:

A copy of a certificate of insurance, a certificate of authority to self-insure issued by the Commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a Project is required for the duration of the Project.

Duration of the Project includes the time from the beginning of the Work on the Project until the Contractor's/person's Work on the Project has been completed and accepted by the governmental entity.

Persons providing services on the Project ("Subcontractor" in Texas Labor Code 406.096) include all persons or entities performing all or part of the services the Contractor has undertaken to perform on the Project, regardless of whether that person contracted directly with the Contractor and regardless of whether that person has employees. This includes, without limitation, independent Contractors, Subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity that furnishes persons to provide services on the Project.

Services include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a Project. Services do not include activities unrelated to the Project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

The Contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code 401.011(44) for all employees of the Contractor providing services on the Project for the duration of the Project.

The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the Contract.

If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the Project, then the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

The Contractor shall obtain from each person providing services on a Project, and provide to the governmental entity:

1. A certificate of coverage, prior to that person beginning work on the Project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the Project; and
2. No later than seven days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project.

The Contractor shall retain all required certificates of coverage for the duration of the Project and for one year thereafter.

The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten days after the Contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project.

The Contractor shall post on each Project site a notice, in the text, form, and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the Project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

The Contractor shall contractually require each person with whom it contracts to provide services on a Project, to:

1. Provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code 401.011(44) for all of its employees providing services on the Project for the duration of the Project;
2. Provide to the Contractor, prior to that person beginning work on the Project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the Project for the duration of the Project;
3. Provide the Contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the Project.
4. Obtain from each other person with whom it contracts, and provide to the Contractor:
 - a. A certificate of coverage, prior to the other person beginning work on the Project; and
 - b. A new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the Project;
5. Retain all required certificates of coverage on file for the duration of the Project and for one year thereafter;
6. Notify the governmental entity in writing by certified mail or personal delivery, within ten days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the Project; and
7. Contractually require each person with whom it contracts to perform as required by items 1-6, with the certificates of coverage to be provided to the person for whom they are providing services.

By signing this Contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the governmental entity that all employees of the Contractor who will provide services on the Project will be covered by workers' compensation coverage for the duration of the Project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the Commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

The Contractor's failure to comply with any of these provisions is a breach of Contract by the Contractor that entitles the governmental entity to declare the Contract void if the Contractor does not remedy the breach within ten days after receipt of notice of breach from the governmental entity.

The coverage requirement recited above does not apply to sole proprietors, partners, and corporate officers who are excluded from coverage in an insurance policy or certificate of authority to self-insure that is delivered, issued for delivery, or renewed on or after January 1, 1996. 28 TAC 110.110(i)

5.7.3 Commercial General Liability Insurance (Occurrence Basis Only)

5.7.3.1 The Owner shall be named additional insured on the Contractor's policy with waiver of subrogation as to the subject job.

5.7.3.2 Bodily injury and property damage:

1. Each Occurrence \$1,000,000
2. General Aggregate \$2,000,000
3. Products/Completed Operations
 - a. Aggregate \$1,000,000
4. Personal and Advertising Injury
 - a. Occurrence \$1,000,000
5. Fire Damage, Legal Liability
 - a. Any One Fire \$50,000
6. Medical Expenses
 - a. Any One Person \$5,000

5.7.4 Business (Commercial) Automobile Liability Insurance All Owned, Non-Owned, and Hired Coverage

1. Automobile Liability \$1,000,000
2. The Owner shall be named additional insured on the Contractor's policy with waiver of subrogation as to the subject job.

5.7.5 Deletions and Exclusions

1. No deletions/exclusions from standard coverage forms shall be permitted, without the written consent of the Owner for Commercial General Liability Insurance or Business (Commercial) Automobile Liability Insurance.

5.7.6 Umbrella Liability Insurance

- .1 Umbrella shall be issued as "Follow Form Policy".
- .2 This policy shall provide coverage over the Workmen's Compensation, Commercial General Liability, and Business (Commercial) Automobile Liability (Covering All Owned, Non-Owned, and Hired Vehicles.)

5.7.7 Builder's Risk Insurance:

The Contractor shall obtain at the Contractor's expense, All Risk Property Insurance coverage, acceptable to the Owner, in the amount of insurance equal at all times to the insurable value of materials delivered and labor performed. The policy so issued in the name of the Contractor shall also name all Subcontractors and the Owner as additional insured, as their respective interests may appear. The policy shall have endorsements as follows: "This insurance shall be specific as to coverage and not considered as contributing insurance with any permanent insurance maintained on the present premises."

- .1 The policy shall be written in the name of the Owner and Contractor as their interest may appear.
- .2 The policy shall be written on all risk basis for physical loss or damage and include the vandalism, malicious mischief.
- .3 The amount of coverage shall be for the full insurable value of Work.
- .4 The deductible shall not be over \$1,000.00 without approval of the Owner. (Deductible losses shall be paid by the Contractor.)
- .5 The policy shall include an endorsement allowing Owner occupancy, and the insurance shall not be canceled or altered on account of partial occupancy prior to completion.
- .6 The original Builder's Risk Policy shall be furnished to the Owner prior to start of the job. This shall be a "Stand Alone" Policy.
- .7 The Policy shall include \$500,000 extra expense.

5.8 Safety Precautions and Emergencies:

5.8.1 It shall be the duty and responsibility of the Contractor and all of its Subcontractors to be familiar and

comply with all requirements of Public Law 91-596 enacted by Congress, December 29, 1970, cited as the Occupational Safety and Health Act of 1970, and all amendments thereto, commonly referred to as OSHA, and to enforce and comply with all of the provisions of this Act. The Owner reserves the right to enforce standard safety practices through the Contractor, which shall take immediate action when notified either orally or written of an unsafe condition.

5.8.2 In any emergency affecting the safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor resulting from response to an emergency shall be considered in accordance with Article 6 - Contract Changes.

5.9 Materials and Workmanship: All Work shall be executed in accordance with the Contract Documents, complete in all parts and in accordance with approved practices and customs, and of the best finish and workmanship. Unless otherwise specified, all materials and equipment incorporated in the Work under the Contract shall be new.

5.10 Tests: If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to be inspected, tested or approved, the Contractor shall give the Owner and the Architect/Engineer timely notice of its readiness and of the date arranged so that the Architect/Engineer may observe such inspection, testing or approval.

5.10.1 The Owner shall pay for all routine testing of materials agreed by the Architect/Engineer and the Owner to be required by the Contract Documents or to be in the best interests of the Owner. When retesting of material failing the initial test is required, the cost of retesting will be paid for by the Contractor. Any special testing which is specifically required in the scope of Work and specifically stipulated to be the responsibility of the Contractor in a technical section of the Project Manual shall be paid for by the Contractor.

5.10.2 Should testing of suspected non-compliant material or Work require that completed Work be removed to accomplish the testing, and further should the testing demonstrate that the material or Work fails to comply with the requirements of the Contract Documents, the Contractor shall bear all costs of the testing, inspection or approval as well as the cost of replacement of unsatisfactory material or Work as provided by paragraph 5.11. Should the testing demonstrate that the Work or material is in compliance, the Owner shall bear such costs and an appropriate Change Order shall be issued.

5.10.3 Material compliance with the Contract Documents shall be made by one of the following:

1. Manufacturer's certificate of compliance.
2. Mill certificate.
3. Testing laboratory certification.
4. Report of actual laboratory test from the Owner's laboratory or from a laboratory satisfactory to the Owner. Samples tested shall be selected by or in the presence of the Owner and the method of testing shall comply with the professional societies' standard specifications.

5.11 Removal of Defective Work: The Owner's representatives and the Architect/Engineer shall interpret the Contract requirements and shall be the final judge of the acceptability of the Work under the Contract Documents.

5.11.1 If any materials furnished under this Contract are judged to be not in compliance with requirements of the Contract Documents by the Owner and/or the Architect/Engineer, then the Owner and/or the Architect/Engineer will deliver to the Contractor a notification of such non-compliance in writing. The Contractor shall, after having received such written notice of non-compliance, proceed to remove from the grounds or buildings all materials (whether worked or unworked) and to take down all portions of the Work which the Owner and/or Architect/Engineer shall by such written notice condemn as unsound or improper or as in any way failing to conform to the requirements of the Contract Documents; and shall make good all Work damaged or destroyed thereby.

5.11.2 The Contractor shall, without charge, replace any material or correct any workmanship found by the Owner or Architect/Engineer not to conform to the requirements of the Contract Documents, unless in the public interest the Owner consents in writing to accept such material or workmanship with an appropriate adjustment in the Contract Sum. The Contractor shall promptly correct all Work rejected by the Owner or Architect/Engineer as defective or as failing to conform to the Contract Documents whether observed before or after the date of Substantial Completion or Final Inspection and acceptance and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work.

5.11.3 If the Contractor does not promptly replace rejected material or correct rejected workmanship, the Owner may, 1) replace such materials or correct such workmanship and charge the cost thereof to the Contractor, or 2) terminate the Contractor's employment in accordance with Paragraph 4.5, Contract Termination.

5.11.4 If any portion of the Work is covered contrary to the instructions of the Owner or Architect/Engineer or to the

requirements specifically expressed in the Contract Documents, then it must be uncovered for observation or testing and recovered at the Contractor's expense without change in the Contract Time.

5.11.5 If any other portion of the Work is covered which the Owner or Architect/Engineer has not specifically requested to observe prior to being covered, then either may request to see such Work and it shall be uncovered by the Contractor. If such Work is found to be in accordance with the Contract Documents, then the cost of uncovering and recovering shall, by appropriate Change Order, be charged to the Owner. If such Work is found not to be in accordance with the Contract Documents, then the Contractor shall pay such costs.

5.12 Royalties Patents and Copyrights: The Contractor shall pay all royalties and license fees, and defend all suits or claims for infringement of any copyrights and patent rights; and shall save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for all such royalties and license fees and loss when a particular design or process, or the product of a particular manufacturer or manufacturers is specified; provided, however, if the Contractor has reason to believe that the required design, process or product specified is an infringement of a copyright or a patent, then the Contractor shall be responsible for such royalties, license fees and loss unless the Contractor promptly gives information to the Owner and the Architect/Engineer.

5.13 Equivalent Materials: It is not the intent of these Contract Documents to limit materials to the product of any particular manufacturer. Where definite materials, equipment and/or fixtures have been specified by name, manufacturer or catalog number, it has been done to set a definite standard and a reference for comparison for quality, function, application, physical conformity, and other characteristics. It is not the intention to discriminate against or prevent any dealer, jobber or manufacturer from furnishing materials, equipment, and/or fixtures which meet or exceed the characteristics of the specified items as judged by the Owner and/or the Architect/Engineer. Substitution of materials shall not be made without prior written approval of the Owner and the Architect/Engineer.

5.13.1 The Contractor shall be responsible for any additional costs or delays resulting from having furnished materials, equipment or fixtures other than those specified or subsequently approved, and shall reimburse the Owner for any increased design costs resulting from such substitutions.

5.13.2 The Owner shall be the final judge of whether a proposed substitution meets or exceeds the characteristics of a specified item and decisions of the Owner relative to the

equivalency of items proposed as substitutes for specified items shall be final and conclusive.

5.14 Technical Submittals:

5.14.1 Definition: Technical Submittals include Shop Drawings, Product Data, Installation Instructions, Samples, and other submittals which are typically related to construction materials, products, systems or services, and which are required by the Contract Documents.

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

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

5.14.1.3 Samples are physical examples furnished by the Contractor which illustrate materials, equipment or workmanship, and which establish standards by which the Work will be judged.

5.14.2 The Contractor shall submit within three (3) months after the date of the Notice to Proceed, and in orderly sequence, all Technical Submittals required by the Contract Documents, or subsequently required by the Architect/Engineer as covered by Contract modifications. The Contractor shall review them for compliance with Contract Documents and shall certify that the Contractor has done so by stamp, or otherwise, affixed to each copy thereof. Submittal data presented without such certification will be returned without review or other comment, and any delay resulting there from will be the Contractor's responsibility.

5.14.2.1 The Contractor shall, within twenty (20) calendar days after receipt of the Notice to Proceed, submit to the Owner through the Architect/Engineer two (2) copies of a list of submittals, in a form acceptable to the Owner, which lists all Technical Submittals that are required by the Contract, and indicates which are to be reviewed and certified by the Contractor. The list shall then be reviewed and approved by the Owner and/or the Architect/Engineer.

5.14.2.1.1 The schedule shall include, but is not necessarily limited to, all Technical Submittals, certificates of compliance, material samples, material color charts or samples, guarantees, operation and maintenance instructions, etc.

5.14.2.1.2 The schedule shall indicate the type of item, Contract requirements reference, the Contractor's scheduled

dates for submitting the items, the projected need dates for approval from the Owner or the Architect/Engineer, and the projected or actual dates for procurement. The schedule shall show a minimum of fifteen (15) calendar days after receipt for review by the Owner and Architect/Engineer. If resubmittal is required, then an additional fifteen (15) days will be allowed for review after receipt. The Contractor will revise and/or update this schedule as appropriate, and submit same with each monthly Application for Payment.

5.14.2.1.3 The submittal schedule shall be coordinated with the Owner-reviewed, Contractor prepared and submitted construction schedule for all the Work. The Contractor shall revise and/or update the submittal schedule monthly to insure consistency with the construction schedule. The Owner shall be provided with two (2) copies of each revised submittal schedule.

5.14.3 Technical Submittals shall be properly identified, as specified or as the Owner and/or Architect/Engineer may require. At the time of submission, the Contractor shall inform the Owner and the Architect/Engineer in writing of any deviations in the Technical Submittals from the requirements of the Contract Documents.

5.14.4 By providing Technical Submittals, the Contractor thereby represents that the Contractor has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data, or will do so; that the Contractor has checked and coordinated each Technical Submittal with the requirements of the Work and of the Contract Documents; and that the Contractor shall so certify as required by Subparagraph 5.14.2.

5.14.5 The Architect/Engineer and/or the Owner will review the Technical Submittals with reasonable promptness, but only for conformance with the design concept of the Project and with the information given in the Contract Documents. The review of a separate item shall not indicate approval of an assembly in which the item functions. Review of the Technical Submittals shall not relieve the Contractor of responsibility for any deviations from the requirements of the Contract Documents unless the Contractor has informed the Owner and the Architect/Engineer in writing of such deviations at the time of submittal and the Owner or the Architect/Engineer has not objected to the specific deviations. The approval shall not relieve the Contractor from responsibility for errors or omissions in the Technical Submittals.

5.14.6 The Contractor shall make any corrections required and shall resubmit the required number of corrected copies of the Shop Drawings or Product Data or new Samples of materials until accepted. The Contractor shall direct specific attention in writing to any new revisions other than the corrections requested on previous submissions.

5.14.7 No Work requiring a Technical Submittal shall be performed until the submittal has been reviewed. All such Work shall be in accordance with the reviewed Technical Submittal.

5.15 Cleaning: The Contractor shall at all times keep the premises and surrounding area clean and free from accumulation of waste materials or rubbish caused by the Work under this Contract. Upon completion of the Project, and prior to the Final Inspection, the Contractor shall have the premises in a neat and clean condition.

ARTICLE 6

CONTRACT CHANGES

6.1 Change Orders: A Change Order is a written order to the Contractor signed by the Owner, the Contractor and the Architect/Engineer, and issued after execution of the Contract which authorizes a change in the Work or an adjustment in the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. A Change Order signed by the Contractor indicates the Contractor's agreement therewith, including the adjustment in the Contract Sum or the Contract Time. It is recognized by the parties hereto and agreed by them that the Contract Documents may or may not be complete, or be free from errors, omissions and imperfections, or require changes or additions in order for the Work to be completed to the satisfaction of Owner. Accordingly, it is the express intention of the parties (notwithstanding any other provisions in this Contract) that any errors, omissions or imperfections in the Contract Documents, or any changes in or additions to same or to the Work ordered by Owner and any resulting delays in the Work or increases in Contractor's costs and expenses, shall not constitute or give rise to any claim, demand or cause of action of any nature whatsoever in favor of Contractor, whether for breach of Contract, quantum merit, or otherwise. However, the Owner shall be liable to the Contractor for the sum stated to be due the Contractor in any Change Order approved and signed by all parties. It is agreed hereby that such sum, together with any extension of time contained in said Change Order, shall constitute full compensation to the Contractor for all costs, expenses and damages to the Contractor, whether direct, consequential or otherwise in any wise incident to, arising out of, or resulting directly or indirectly from the Work performed by the Contractor under such Change Order.

6.1.1 The Owner, without invalidating the Contract and without approval of the Surety, may order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and the Contract Time being adjusted accordingly. All such changes in the Work shall be authorized by Change Order

or Construction Change Directive and shall be performed under the applicable conditions of the Contract Documents.

6.1.1.1 Any other written order or oral order (which terms as used in this paragraph shall include direction, instruction, interpretation, or determination) from the Architect/Engineer or Owner shall be treated as a Change Order under this clause only if the Contractor gives the Owner written notice within twenty (20) days stating the date, circumstances, source of the order and that the Contractor regards the order to be a Change Order.

6.1.1.2 The Owner may, in writing, issue a Notice to Proceed for any portion of the Work in a Change Order for which final adjustment in Contract Sum and/or Contract Time has not been finalized. The Notice to Proceed letter may have a not-to-exceed cost amount for any or all portions of the Change Order. This amount is not to be exceeded without prior written approval by the Owner.

6.1.2 If the Contractor intends to assert a claim for an adjustment of cost or time over and above any adjustment already granted in a Change Order, then the Contractor must (within twenty (20) calendar days after receipt of a written Change Order, or receipt of oral or written order to proceed with a proposed change under Clause 6.1.1.2, or after the furnishing of a written notice under Clause 6.1.1.1) submit to the Owner a written statement setting forth in detail the nature and monetary extent of such claim as per Paragraph 6.3. The Contractor shall certify that the claim is made in good faith and that the supporting data is current, accurate and complete to the best of the Contractor's knowledge and belief, and that the amount requested accurately reflects the Contract adjustment for which the Contractor believes the Owner is liable. Failure to certify a claim will result in a determination that no claim has been filed. The thirty (30) day period of time for submission of such claim may be extended only by written agreement signed by the Owner. Except for claims based on defects in drawings or specifications furnished by the Owner, no claim for any change under Subparagraph

6.3.1 shall be allowed for any costs incurred more than twenty (20) days before the Contractor gives written notice as therein required; provided that, in the case of claims based on defects in drawings or specifications furnished by the Owner, the adjustment in cost shall include only those increased direct costs reasonably and necessarily incurred by the Contractor as a result of such defective drawings or specifications.

6.1.3 Except as provided above, no order, oral statement, or direction of the Owner or the Owner's duly appointed representative shall be treated as a change under this Article or entitle the Contractor to an adjustment thereunder.

6.1.4 The Contractor agrees that the Owner or any of its duly authorized representatives shall have access to and the right to examine any directly pertinent books, documents, papers, and records of the Contractor. Further, the Contractor agrees to include and submit evidence that all of its subcontracts include a provision to the effect that the Subcontractor agrees that the Owner or any of its duly authorized representatives shall have access to and the right to examine any directly pertinent books, documents, papers and records of such Subcontractor relating to any claim from the Contract, whether or not the Subcontractor is party to the claim. The period of access and examination described herein which relate to appeals under Subparagraph 5.2.1, litigation, or the settlement of claims arising out of the performance of this Contract shall continue until final disposition of such claims, appeals or litigation.

6.2 Unit Prices: If unit prices are stated in the Contract Documents or subsequently agreed upon, and if the quantities originally contemplated are so changed in a proposed Change Order or Construction Change Directive that application of the agreed unit prices to the quantities of Work proposed will cause substantial inequity to the Owner or the Contractor, then the applicable unit prices shall be equitably adjusted as provided herein.

6.2.1 Each unit price proposed by the Contractor shall include all costs applicable to the Work including, but not limited to, mobilization, demobilization, labor, materials, equipment, supervision, delays, overhead at any level, and profit.

6.2.2 Either party may request an equitable adjustment. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above one hundred and fifteen percent (115%) or below eighty-five percent (85%) of the originally specified amount. If the quantity variation causes an increase in the time necessary for completion, then the Owner (upon receipt of a written request for an extension of time within thirty (30) days from the recognition of the variation or within such further period of time as may be granted by written agreement signed by the Owner) will ascertain the facts and make such adjustment for changing the completion date as in its judgment the findings justify.

6.3 Claims for Additional Costs:

6.3.1 If the Contractor wishes to make a claim for an increase in the Contract Sum, then the Contractor shall give the Owner and the Architect/Engineer written notice thereof within thirty (30) days after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property in which case the Contractor shall proceed in accordance with

Subparagraph 5.8.2. No such claim shall be valid unless so made and the Contractor hereby waives all claims for which such notice is not given. If the Owner and the Contractor cannot agree on the amount of the adjustment in the Contract Sum, it shall be determined by administrative procedures as provided in Subparagraph 5.2.1. Any changes in the Contract Sum resulting from such claim shall be authorized by Change Order.

6.3.2 If the Contractor claims that additional cost is involved because of, but not limited to, (1) any written interpretation of the Contract Documents, (2) any order by the Owner to stop the Work pursuant to Subparagraph 4.5.3 where the Contractor was not at fault, (3) any written order for a minor change in the Work issued pursuant to Paragraph 6.5, then the Contractor shall make such claim as provided in Subparagraph 6.3.1 in a timely manner which will not have an effect on the construction schedule.

6.3.3 Any claim shall contain the following elements: (1) an analysis of the relevant Contract provisions, (2) a description of the facts, (3) a statement of why the particular facts warrant compensation under the terms of the Contract, (4) supporting cost or pricing data per Paragraph 6.7, (5) legal analysis, if appropriate, (6) expert opinion, if appropriate, (7) certification per Subparagraph 6.3.4, and (8) a formal request for decision. All direct costs should be accurately presented in the claim, i.e., labor should come from payrolls, equipment from equipment reporting forms and materials should be based on invoices.

6.3.4 The Contractor shall certify that the claim is made in good faith, that the supporting data is current, accurate and complete to the best of the Contractor's knowledge and belief, and that the amount requested accurately reflects the Contract adjustment for which the Contractor believes the Owner is liable.

6.3.5 Failure to certify the claim will result in a determination that no claim has been filed.

6.4 Claims for Additional Time: If a change in the Work causes an increase or decrease in the Contract Time, then the Contractor's proposal shall include a reasonable estimate of such increase or decrease based on effects of the Change Order to critical path activities. Any costs associated with a change in the Contract Time is included in the fifteen percent (15%) mark-up.

6.5 Minor Changes: The Architect/Engineer, with concurrence of the Owner, will have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or an extension of the Contract Time. Such changes shall be effected by written order which the Contractor shall carry out promptly.

6.6 Bar to Claims: No claim shall be allowed for an adjustment under this or any other provision of the Contract if asserted after final payment under this Contract.

6.7 Administrative Procedures for Change Orders:

If a change in the Work will result in an increase or decrease in the Contract Sum, then the Owner shall have the right to require the performance thereof on a lump sum basis, a unit price basis or a time and material basis, all as hereinafter more particularly described (the right of the Owner as aforesaid shall apply with respect to each such change in the Work).

6.7.1 Lump Sum Proposal: In responding to a request for a proposed price for a change in the Work, or in submitting a claim, the Contractor shall furnish a lump sum proposal supported by a complete breakdown as described hereafter, indicating the estimated or actual cost to the Contractor for performance of the changed Work, including the applicable percentage of overhead and profit described hereafter. Any request for a time extension must be justified and presented in adequate detail to permit evaluation per Article 8, showing that the proposed change will delay the final Contract Completion Date.

6.7.1.1 A Lump Sum Proposal for the adjustment of Work shall contain the following items:

- .1 Estimated cost, using any discount to the trades, of the materials and supplies used, which shall be itemized completely to include unit cost, quantity and total cost.
- .2 The portion of the proposal relating to labor, whether by the Contractor's forces or the forces of any of its Subcontractors or Sub-subcontractors, may include reasonably anticipated direct wages of jobsite labor (including foremen) who will be directly involved in the change in the Work (for such time as they will be so involved). In addition to the direct wages, payroll costs including Social Security, Federal/State Unemployment Insurance and like taxes may also be included. These payroll costs shall be itemized separately; and the Contractor shall provide verifying documentation of these costs. Furthermore, any fringe benefits required by applicable union/trade agreements in connection with such direct wages may also be included if the Contractor provides verifying documentation of these benefits.
- .3 Estimated cost to the Contractor for additional construction equipment used solely on the Change Order, to include rental rates or owned equipment rates for such items of equipment while in use, which shall be itemized completely to include type(s), the number(s) of each, hourly rate, hours and total cost. Equipment which is regularly used at the job shall be

used in Change Order Work at no extra charge. Rental or owned equipment rates shall be no greater than those established by the Association of General Contractors for the local area. As used herein the terms "construction equipment" and "equipment" shall include wheeled vehicles and small tools.

- .4 Estimated transportation costs for delivery and handling of materials and supplies, bringing to and removing from the site additional construction equipment and/or new items of installed equipment, if applicable, which shall be itemized separately.
- .5 Estimated off-site storage costs in excess of thirty (30) calendar days for new items of installed equipment, if applicable.
- .6 To the Contractor's, Subcontractor's or Sub-subcontractor's cost proposal for Work performed by its own forces, a markup of fifteen percent (15%) shall be added to cover all elements of overhead and profit including, but not limited to, supervision above the level of foremen, estimating, scheduling, procurement, cleanup, temporary facilities, consumables, safety, quality control/assurance, protection, security, small tools, radios, company vehicles, home and branch office costs and expenses of any type whatsoever. To the Contractor's cost proposal five percent (5%) shall be added to the Subcontractor's or Sub-subcontractor's cost proposal to cover processing and management of the added Work. If any of the items included in the lump sum proposal are covered by unit prices contained in the Contract Documents, then the Owner may, if it requires the change in the Work to be performed on a lump sum basis, elect to use these unit prices in lieu of the similar items included in the lump sum proposal. In this event an appropriate deduction will be made in the lump sum amount prior to the application of any allowed overhead and profit percentages. No overhead and profit shall be applied to any unit prices.
- .7 To the summary of the Contractor's proposed cost, the direct cost for insurance and bonds shall be added upon the Contractor providing documentation.

6.7.2. In cases where changes in the Work result in a credit to the Owner, the credit shall be limited to direct costs; that is, no overhead or profit shall be applied to such costs. In cases where a change in the Work results in both credits and charges to the Owner, the Contractor will be allowed to add the overhead and profit percentages indicated in Clause 6.7.1.1 to the net charge based upon the amount by which the total charges exceed the total credits; if there is a net credit, then no overhead or profit shall be charged.

6.7.3 Time and Material Proposal: If the Owner elects to have the change in the Work performed on a time and material basis, the same shall be performed, whether by the Contractor's forces or the forces of its Subcontractors or Sub-subcontractors, at actual cost to the entity performing the change in the Work plus the same markups for overhead and profit as set forth in Clause 6.7.1.1. The Contractor shall submit to the Owner daily time and material tickets which shall include the identification number assigned to the change in the Work, the classification of labor employed (and names and social security numbers), the materials used, the equipment rented (not tools) and such other evidence of cost as the Owner may require. The Owner may require authentication of all time and material tickets and invoices by persons designated by the Owner for such purpose. The failure of the Contractor to secure any required authentication shall, if the Owner elects to treat it as such, constitute a waiver by the Contractor of any claim for the cost of that portion of the change in the Work covered by a non-authenticated ticket or invoice; provided, however, that the authentication of any such ticket or invoice by the Owner shall not constitute an acknowledgement by the Owner that the items thereon were reasonably required for the change in the Work.

6.7.4 Submission Time: Contractor's proposals for changes in the Contract Sum or Contract Time for Change Order Work shall be submitted within fourteen (14) calendar days of the Owner's or A/E's written request for same, unless the Owner or A/E extends such period of time due to the circumstances involved. If such proposals are not timely received, or if the changed Work should start immediately to avoid damage to the Project or to avoid a delay, then the Owner may (at its discretion and in the interest of prosecuting the Work to timely completion) direct the Contractor to proceed with the changed Work. In this case the Owner shall direct the Contractor in writing to proceed with the Work on a time and material basis in compliance with Paragraph 6.7.3. This directive shall be known as a "PDL-NTE" (Price Determined Later - Not To Exceed). If such directive is given orally to the Contractor by the Owner under the above procedure, then the oral directive shall be confirmed in writing by the Contractor within seven (7) calendar days. The cost or credit and time adjustments will be determined through negotiation as soon as practicable thereafter and will be incorporated in a Change Order to the Contract. Prior to such negotiations, the Contractor shall keep separate costs on the "PDL-NTE" Work done up to that point.

6.7.5 Processing: The Owner will undertake to formally process Owner-Contractor agreed Change Orders with thirty (30) calendar days of agreement.

6.7.6 Construction Change Directive: If the Owner and the Contractor fail to agree on the terms of a Change Order,

then the Owner shall issue through the Architect/Engineer a Construction Change Directive which is a written order directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum and/or Contract Time.

6.7.6.1 A Construction Change Directive may be issued before, during or after changed Work is accomplished, under the following conditions:

- .1 The Contractor fails to submit a timely price and/or time extension proposal for the changed Work.
- .2 Negotiation fails to achieve an agreed price and/or time extension, or there remains a disagreement concerning any part of the changed Work.
- .3 Contractor fails or refuses to timely execute a Change Order by affixing the Contractor's signature thereto.

6.7.6.2 The terms of a Construction Change Directive including the change in Contract Sum and/or Contract Time shall be determined by the Owner with the assistance of the Architect/Engineer and shall, in the Owner's judgment, be fair and reasonable.

6.7.6.3 When a Construction Change Directive has been issued, it shall have the full force and effect of a Contract modification. It shall be included in schedules, Applications for Payment, reports and all official records of the Contract. The issuance of a Construction Change Directive will not prejudice any of the Contractor's rights to make claims or to appeal disputed matters under provisions of this Contract.

6.7.7 Notice to Proceed with Change Order Work: It is recognized that time is often of the essence in the execution of Change Order Work. Accordingly, the Owner may issue written notices to proceed with the Change Order Work while the formal Change Order is still being processed. The Contractor shall comply with these notices to proceed on the representation that formal confirming Change Orders will be issued.

ARTICLE 7

CONTRACT PAYMENTS

7.1 Schedule of Values: Upon execution of the Contract by the Owner and the Contractor, the Contractor shall submit for approval to the Owner and the Architect/Engineer a breakdown of the Contract Sum, itemizing material and labor for the various classifications of the Work. This Schedule of Values will be used as the basis for the Contractor's Applications for Payment.

7.1.1 No Application for Payment will be considered prior to receipt and approval of the Schedule of Values, which shall be in such detail as may be required by the Owner. The Schedule of Values shall be submitted to the

Architect and Owner not less than twenty (20) days prior to the first Application for Payment, and this shall be a condition precedent to the processing of the first payment. The Schedule of Values shall follow the trade divisions of the Project Manual. Each item shall be assigned labor or material values, or both, with the subtotal thereof equaling the value of the Work in place when completed. Contractor's overhead and profit, mobilization, bond, and insurance shall each be listed as a separate line item on the Schedule of Values. The sum of all line items shall equal the Contract Sum.

7.1.2 The Contractor shall submit with the Schedule of Values a copy of all worksheets used in preparation of its proposal, supported by a notarized statement that the worksheets are true and complete copies of the documents used to prepare the proposal. The Contractor's proposal sheets shall be handled as confidential documents to the extent permitted by law.

7.2 Progress Payments: Payment will be made to the Contractor upon receipt of monthly Applications for Payment as provided hereinafter for the Work performed, and materials suitably stored and protected on the construction site. Progress payments do not constitute acceptance of Work not in accordance with the Contract Documents. Contractor shall provide a Department of the Treasury I.R.S. Form W-9 (latest edition) to the Owner prior to the first Application for Payment.

7.2.1 Once each calendar month, the Owner shall make a progress payment to the Contractor based upon an Application for Payment certified by the Architect/Engineer (for Work performed under this Contract during the preceding calendar month) which shall be accompanied by an affidavit that all payrolls, bills for labor, materials, equipment, or other indebtedness connected with such Work have been paid or will be paid within thirty (30) days after the Owner's receipt of the Application for Payment, or within the period of time required by Government Code, Chapter 2251, Subchapter B (see below), and a Certified Payroll (if specifically requested by Owner).

2251.021 Time for Payment by Governmental Entity.

- a) Except as provided by Subsection
- b), a payment by a governmental entity under a Contract executed on or after September 1, 1987, is overdue on the 31st day after the later of:
 - 1) the date the governmental entity receives the goods under the Contract;
 - 2) the date the performance of the service under the Contract is completed; or

3) the date the governmental entity receives an invoice for the goods or services.

b) A payment under a Contract executed on or after September 1, 1993, owed by a political subdivision whose governing body meets only once a month or less frequently is overdue on the 46th day after the later event described by Subsections a)1) through 3).

c) For a Contract executed on or after July 1, 1986, and before September 1, 1987, a payment by a governmental entity under that Contract is overdue on the 46th day after the later event described by Subsections a)1) through 3).

Added by Acts 1993, 73rd Leg., ch. 268, 1, eff. Sept. 1, 1993. Amended by Acts 1995, 74th Leg., ch. 76, 5.42(a), eff. Sept. 1, 1995.

2251.022

Time for Payment by Vendor

- a) A vendor who receives a payment from a governmental entity shall pay a Subcontractor the appropriate share of the payment not later than the 10th day after the date the vendor receives the payment.
- b) The appropriate share is overdue on the 11th day after the date the vendor receives the payment.

Added by Acts 1993, 73rd Leg., ch. 268, 1, eff. Sept. 1, 1993.

2251.023 Time for Payment by Subcontractor

- a) A Subcontractor who receives a payment from a vendor shall pay a person who supplies goods or a service for which the payment is made the appropriate share of the payment not later than the 10th day after the date the Subcontractor receives the payment.
- b) The appropriate share is overdue on the 11th day after the date the Subcontractor receives the payment.

Added by Acts 1993, 73rd Leg., ch 268, 1, eff. Sept. 1, 1993.

7.2.2 To insure the proper performance of this Contract, the Owner shall retain not less than five percent (5%) of the amount of each Application for Payment until final completion and acceptance of all Work covered by this

Contract. If the Owner, at any time after fifty percent (50%) of the Work has been completed, finds that satisfactory progress is being made, then the Owner may make any of the remaining progress payments in full; and provided further that, upon completion and acceptance of each separate building, or other division of the Contract on which the price is stated separately in the Contract, payment may be made in full including retained percentages thereon less authorized deductions. After Substantial Completion of the Work the Owner shall, upon application by the Contractor, approved by the Architect/Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than the retainage stipulated in the Contract Documents, and if bonds have been furnished as provided in Article 3, such payment may be made under the terms and conditions governing final payment, and shall not constitute a waiver of claims. Final payment shall be made after completion of the Work by the Contractor in accordance with the Contract Documents.

7.2.2.1 The provisions of Government Code 2251.021 through 2251.023 apply to payments under this Contract.

7.2.2.2 Any request for reduction or release of retainage shall be accompanied by written consent of the Contractor's Surety to the request.

7.2.3 In preparing Applications for Payment all materials delivered and labor performed shall be included in the progress upon which payment is based. However, payment for materials will not be made prior to approval of materials for which submission of a Technical Submittal is required. Furthermore, payment for stored materials will be on the basis of provided invoices.

7.2.4 The Owner may withhold or, on account of subsequently discovered evidence, nullify that part of any Application for Payment to such extent as may be necessary to protect the Owner from loss on account of:

- .1 Defective Work not remedied.
- .2 Damage to Work of another Contractor.
- .3 Failure to maintain scheduled progress.
- .4 Receipt of written notice by the Owner of unpaid bills, as stipulated in Sec. 53.232, Texas Property Code, if the Contractor has not provided a payment bond and if the Contract Sum does not exceed \$25,000.00. Any funds so withheld shall be released to the Contractor if the Contractor furnishes a bond for release of lien as provided in Sec. 53.236, Texas Property Code. When the above grounds are removed, payment will be made for amounts withheld because of them.
- .5 Persistent failure to carry out the Work in accordance with the Contract Documents.

- .6 Reasonable evidence that the Work will not be completed within the Contract Time.
- .7 Reasonable evidence that the Work cannot be completed for the remainder of the Contract Sum.
- .8 Assessment of fines for violations of Prevailing Wage Rate laws.

7.2.5 All material and Work covered by progress payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and Work upon which payments have been made or the restoration of any damaged Work, or as a waiver of the right of the Owner to require the fulfillment of all of the terms of the Contract.

7.2.6 Payments to the Contractor shall not be construed to release the Contractor or the Contractor's Surety from any obligations under this Contract.

7.2.7 Upon the Owner's request, manifest proof of the status of Subcontractor accounts shall be furnished in a form acceptable to the Owner.

7.2.8 Applications for Payment must be signed by a corporate officer or a representative specifically named by the Contractor.

7.2.9 If the Owner so requires, then the Contractor in requesting payment for materials, shall provide copies of bills of lading, invoices, delivery receipts or other evidence of the location and value of such materials.

7.3 Claims for Unpaid Labor and Materials:

7.3.1 When the value of the Contract between the Owner and the Contractor is not in excess of \$25,000.00, claimants are referred to Texas Property Code, Section 53.231, for requirements that are prerequisite to the filing of a valid lien on funds unpaid to the Contractor at the time of filing of the claim.

7.3.2 When the Contract between the Owner and the Contractor is in excess of \$25,000.00, claims must be sent directly to the Contractor and the Contractor's Surety in accordance with Chapter 2253, Texas Government Code. The Owner will furnish, in accordance with such Article, a copy of the Payment Bond to claimants upon their request.

7.3.3 All claimants are cautioned that no lien exists on the funds unpaid to the Contractor on such Contract, and that reliance on notices sent to the Owner may result in loss of their rights against the Contractor and/or the Contractor's Surety. The Owner is not responsible in any manner to a claimant for collection of unpaid bills, and accepts no such

responsibility because of any representation by any agent or employee.

ARTICLE 8

CONTRACT COMPLETION TIME

8.1 Notice to Proceed: The Contract Time will begin on the date designated in the Notice to Proceed issued by the Owner after receipt of the fully executed Owner-Contractor Agreement, the Performance Bond, Payment Bond, and required insurance documentation. The Contractor is required to complete the Work in the time that is stated in the Supplementary Conditions of the Contract for Construction or any extension thereof. The Owner may delay the Work, or any part thereof, for any reason, in which case the time for completion of the Work will be extended by an equivalent amount of time.

8.2 Construction Schedule:

8.2.1 The Contractor is responsible for developing its own schedule logic with appropriate durations and manpower; however, all information must be acceptable and compatible with the Owner's needs, and all target, completion and milestone dates generated must be acceptable to the Owner. Within 14 days after the Notice to Proceed, the Contractor shall prepare and submit for approval by the Owner a detailed network construction schedule using precedence format with activity numbers based on a reasonable, rational system for identification purposes. Durations shall be in working days and appropriate to the activity. The Owner reserves the right to reject any schedule or report that fails to reflect timely completion of the Project, or any intermediate milestone, or otherwise indicates unrealistic performance. Failure of the Contractor to deliver satisfactory schedules or reports to Owner will result in temporary suspension of progress payments.

8.2.2 The detailed construction schedule submitted by the Contractor shall reflect complete sequence of construction by activity including:

- .1 Submittal and shop drawing activities for procurement packages and equipment,
- .2 Product procurement and delivery dates including long lead items,
- .3 Contractual milestone dates,
- .4 Dates for beginning and completion of each element of construction,
- .5 Disruptions and shutdowns due to other operations, facilities and functions,
- .6 Anticipated periods of overtime or shift work,
- .7 Dates for installation and testing of all equipment,
- .8 Cleanup,
- .9 Contract startup and closeout.

8.2.3 On a weekly basis, the current detailed construction schedule shall be provided by the Contractor, who shall give a brief report describing activities begun or finished during the preceding week and a projection of all activities to be started or finished in the week to follow.

8.2.4 Each month the Contractor shall provide a revised detailed construction schedule consisting of bar chart summaries and (if requested by the Owner) revised network diagrams and tabular lists of activities plus certified data which:

- .1 shows all changes occurring since the previous submission of the updated schedule,
- .2 indicates progress of each activity and shows completion dates,
- .3 includes:
 - .1 major changes in scope and logic changes
 - .2 activities modified since previous updating
 - .3 identification of any slippage
 - .4 revised projections due to changes
 - .5 out-of-sequence progress
 - .6 other identifiable changes

In the event that a revised detailed construction schedule is not acceptable to the Owner, then said schedule shall be revised by the Contractor until it is found acceptable by the Owner.

8.3 Delays and Extension of Time:

8.3.1 The Contractor may be granted a time extension by the Owner because of changes ordered in the Contract or because of strikes, lockouts, fire, unusual delay in transportation, unavoidable casualties, inclement weather in excess of normal, or any cause beyond the Contractor's control, which affected critical path activities. The Owner may extend the Contract Time subject to the following provisions.

8.3.2 Claims for time extensions must be made in writing within thirty (30) calendar days after the occurrence of the delay. All time extension claims shall be supported by comparing the original Construction Schedule with an updated Schedule indicating delays to critical path activities. In the case of a continuing cause of delay, only one claim is necessary. Claims for time extensions shall be stated in numbers of whole or half work days. In case of claims for time extension because of inclement weather in excess of normal, such time extension shall be granted only because such inclement weather prevented the execution of critical path activities of Work which delayed the final completion of the Contract. Resolution of delay claims shall be made at the Date of Substantial Completion.

8.3.2.1 The Owner's representative shall ascertain the facts and the extent of the delay and extend the Contract Time when (in the representative's judgment) the findings justify such an extension of Contract Time. The findings of the Owner's representative are final and conclusive on both parties and subject only to appeal as provided in Subparagraph 5.2.1.

8.3.2.2 The Contractor shall notify the Owner of delays to critical path items as they occur; and these delays shall be identified during the weekly progress meetings.

8.3.2.3 Time extensions granted for causes described herein will be granted on the basis of one Regular Work Day extension for each Regular Work Day lost (i.e., seven (7) calendar days extension will be granted after five (5) Regular Work Days are lost except as modified by the provisions contained herein related to Anticipated Inclement Weather days).

8.3.2.4 Each Proposer shall include Anticipated Inclement Weather Days in his proposed Contract Time as noted in the following schedule:

Number of Anticipated Inclement Weather Days to be Included in Proposed Contract Time (These are regular work days)

January	-3	July	-4
February	-4	August	-4
March	-4	September	-4
April	-2	October	-3
May	-5	November	-5
June	-6	December	-4

8.3.2.5 Inclement Weather Days shall pertain to such items as rain, flooding, snow, unusually high winds, which prevent progress on major portions of the Work on regular work days only. If such situations occur on more than the Number of Anticipated Inclement Weather Days included in the Proposed Contract Time and if those additional days prevent the Contractor from performing critical portions of the scheduled Work, then time extensions caused by inclement weather may be requested as enumerated hereinafter. If the inclement weather is rain related, then the rain at the site must have been in excess of 0.50 inch in 24 hours.

8.3.2.6 At the beginning of each month the Contractor shall submit a schedule showing 1) the scheduled number of Anticipated Inclement Weather Days for the particular month, 2) the Actual Inclement Weather Days requested, and 3) the Net Inclement Weather Days (plus, minus, or no change). At times deemed appropriate by the Architect, the Contract Time will be adjusted by Change Order if the total of Net Inclement Weather Days is substantially greater than 0. If at the end of the Project all Anticipated Inclement Weather Days have not been used, then the Contract Time

will not be reduced. An example of the monthly schedule to be submitted is as follows:

<u>Month</u>	<u>Anticipated Inclement Weather Days(Regular)</u>	<u>Actual</u>	<u>Net</u>
		<u>Inclement Weather Days (Regular) Requested</u>	<u>Inclement Weather Days(Regular)</u>
January	3	8	5
February	4	0	-4
March	4	2	-2
April	2	2	0
May	5	7	2
June	6	10	4
TOTAL	24	29	5

Using this example, there were five (5) Net Inclement Weather Days (regular) for the first six (6) months of the Project and the extension of Contract Time would be seven (7) calendar days (since a seven (7) calendar days extension is granted after five (5) Regular Work Days are lost).

8.3.3 The Contractor shall have no claim for compensation or damages due to delays in, or hindrances to, the Work and further agrees that the Contractor shall be fully compensated for all delays solely by a time extension.

8.3.4 No time extension shall release the Contractor or the Surety furnishing a performance or payment bond from all obligations thereunder; which obligations shall remain in full force until the discharge of the Contract.

8.3.5 No time extensions will be allowed for any of the following conditions:

8.3.5.1 At least seven (7) hours of available work time out of the work day.

8.3.5.2 Saturdays, Sundays or Holidays unless the Contract requires and stipulates overtime work.

8.3.5.3 Time required for drying of materials when it is possible for the Contractor to enclose the area and use drying devices.

8.3.6 The Contractor shall maintain a Project log indicating all time in excess of one (1) hour for which work was suspended during a work day in order to obtain any time extension.

8.3.7 The Contractor shall obtain approval from the Owner for work during the following times:

8.3.7.1 Saturdays, Sundays or Holidays.

8.3.7.2 Prior to 7:00 am and after 7:00 pm on scheduled work days.

8.4 Completion of Work: The Contractor will be held to account for the Work being completed in the Contract Time, or any extension thereof.

8.4.1 If, in the judgment of the Owner, the Work is behind schedule and the rate of placement of Work is inadequate to regain scheduled progress so as to insure timely completion of the entire Work or a separable portion thereof, then the Contractor, when so informed by the Owner, shall immediately take action to increase the rate of Work placement. This increase shall be accomplished by any one or a combination of the following or other suitable measures:

- .1 An increase in Work forces.
- .2 An increase in equipment or tools.
- .3 An increase in hours of work or number of shifts.
- .4 Expediting delivery of materials.

8.4.2 The Contractor shall, within ten (10) calendar days after being so informed, notify the Owner of the specific measures taken and/or planned to increase the rate of progress together with an estimate as to when scheduled progress will be regained. Should the plan of action be deemed inadequate by the Owner, the Contractor shall take additional steps or make adjustments as necessary to the plan of action until it meets with the Owner's approval. The increased rate of work will continue until scheduled progress is regained. Scheduled progress will be established from the latest revised and accepted progress schedule for the Project. Timely completion will be understood to be the Contract completion date as revised by all time extensions granted at the time acceleration is undertaken. The Contractor shall not be entitled to additional compensation for the additional effort applied to the Work under the terms of this Subparagraph.

8.5 Failure to Complete Work on Time: The time set forth in the Supplementary Conditions of the Contract for Construction for the completion of all Work is an essential element of the Contract. Contractor's failure to complete the Work within such time will cause damage to the Owner. The value of such damages shall be stated in the Supplementary Conditions of the Contract for Construction.

8.5.1 The time specified for completion in the Supplementary Conditions of the Contract for Construction shall cover final cleanup of the premises and completion of punch list deficiencies.

8.5.2 For each consecutive calendar day after the expiration of the Contract Time that any Work (including the correction of deficiencies found during the Final Inspection) is not completed and accepted, the amount per

day as stipulated in the Supplementary Conditions of the Contract for Construction will be deducted from the money due or to become due the Contractor, not as a penalty but as liquidated damages and added expense for Contract supervision and Owner's delay costs in obtaining the use of the Work.

ARTICLE 9

CONTRACT SUBSTANTIAL COMPLETION

9.1 Certification: Should the Owner wish to use or occupy the Project, or part thereof, prior to final completion, and the Project, or a designated portion thereof acceptable to the Owner, is substantially complete, the Contractor shall prepare for and submit to the Architect/Engineer a comprehensive list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Owner and Architect/Engineer on the basis of a Pre-Final Inspection determine that the Project or designated portion thereof is substantially complete, the Architect/Engineer will then prepare a Certificate of Substantial Completion which shall establish the Date of Substantial Completion; shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, operation of permanent equipment, damage to the Work, and insurance; and shall fix the time within which the Contractor shall complete all items on the list accompanying the Certificate.

9.1.1 Prior to the Pre-Final Inspection, and as a prerequisite to issuance of a Certificate of Substantial Completion, the Contractor shall furnish to the Owner all Record Documents, instructional manuals, maintenance manuals, parts catalogs, wiring diagrams, operational manuals, maintenance material stocks, spare parts and tools, specified written warranties, guarantees and like publications or parts for all installed equipment, systems and like items required by the Contract Documents; and shall conduct all instruction of the Owner's personnel required by the Contract Documents. If the Contractor does not furnish these requirements and the Owner must, out of necessity, obtain these materials, instructions, information and data, then the cost for this procurement will be deducted from the monies due the Contractor.

9.1.2 If the Owner must take occupancy of the Project due to compliance with State laws and the Project is not substantially complete, then the Contractor shall purchase extended warranties on equipment which must be in operation for the Owner to take occupancy.

9.2 Date of Substantial Completion: The Date of Substantial Completion of the Project, or designated portion

thereof, is the date jointly certified by the Architect/Engineer, Owner and Contractor when construction is Substantially Complete as herein before defined.

9.3 Additional Inspection Costs: The Contractor shall be charged by the Owner for any costs of re-inspection resulting from substantial differences between the Contractor's list of items to be completed or corrected and the list of items resulting from the Pre-Final Inspection.

ARTICLE 10

CONTRACT FINAL ACCEPTANCE AND PAYMENT

10.1 Notification: When the Project is completed, the Contractor shall notify the Owner in writing that the Project will be ready for Final Inspection on a definite date. Upon verification by the Contractor that the Project is ready for Final Inspection and acceptance, the Architect/Engineer and the Owner will within ten (10) calendar days make a Final Inspection and, when the Project is found acceptable under the Contract Documents and the Contract is fully performed, make final payment to the Contractor.

10.2 Final Payment Documentation: Neither the final payment nor the remaining retained percentage shall become due until the Contractor submits to the Architect/Engineer for transmittal to the Owner:

- .1 Contractor's Affidavit of Payment of Debts and Claims, AIA Document G706
- .2 Contractor's Affidavit of Release of Liens, AIA Document G706A
- .3 Contractor's, Subcontractor's, Sub-subcontractor's, and Supplier's separate releases on the prescribed forms.
- .4 Consent of Surety to Final Payment, AIA Document G707 (if applicable).
- .5 Final list of Subcontractors and Sub-subcontractors, AIA Document G805.
- .6 The Contractor and each and every Subcontractor, Sub-subcontractor and Supplier shall provide a "Certificate of No Asbestos, PCB and Lead". *The form used shall be the attached form on Page 28 of these General Conditions.* For the purpose of definition as used in this form, the term "potable water systems" includes, but is not limited to, those water systems for drinking fountains, all sinks and lavatories, showers, bath tubs, residential and commercial kitchen equipment, icemakers, and hose bibbs, as applicable to this specific Project.
- .7 Material Safety Data Sheets: Effective September 1, 2000, the Texas Department of Health implemented a new rule in the AHERA Regulation which requires that Material Safety Data Sheets be provided to the

Owner by the Contractor on the materials incorporated into the Work which but not limited to the list below (not all of which may have been used in this specific Project):

- .1 Floor Tiles
- .2 Sheet Floorings
- .3 Adhesives (Mastics)
- .4 Suspended Ceiling Tiles
- .5 Glued-on/Nailed-on Ceiling Tiles
- .6 Gypsum Board
- .7 Blown-in Insulation
- .8 Batt/Roll Insulation
- .9 Gaskets
- .10 Sprayed-on/Troweled-on Surfacing Materials
- .11 Pipe Insulation
- .12 Pipe Fitting Insulation
- .13 Boiler Insulation
- .14 Flue Insulation (Vent Pipe Insulation)
- .15 Heating/AC Ducting
- .16 Air Handler Cloth Joint (Flex Joint)
- .17 Air Handler Insulation

If Material Safety Data Sheets are not provided by the Contractor, then the Contractor shall be responsible for obtaining samples of the materials listed above and the required testing of the samples at no additional cost to the Owner. These Material Safety Data Sheets shall be included in the maintenance and instruction manuals.

10.3 Final Payment:

10.3.1 The making of final payment shall constitute a waiver of all claims by the Owner except those arising from:

- .1 Faulty or defective Work appearing after Substantial Completion;
- .2 Failure of the Work to comply with the requirements of the Contract Documents; or
- .3 Terms of any special warranties required by the Contract Documents.

10.3.2 Acceptance of final payment shall constitute a waiver of all claims by the Contractor except those specifically enumerated at the time of final payment.

ARTICLE 11

CONTRACT CORRECTION PERIOD

11.1 One Year Contract Correction Period: Except as otherwise specified, the Contractor warrants and guarantees all Work against defects in materials, equipment or workmanship. For one (1) year from the date of Substantial Completion of the entire Project or designated portions thereof, the Contractor shall undertake correction, repair or replacement of any defective or non-conforming work.

11.2 Remedy of Defects Under Warranty: Upon receipt of written notice from the Owner of the discovery of any defects, the Contractor shall remedy the defects and replace any property damaged therefrom occurring within the contract correction period. If the Contractor, after notice, fails to proceed and remedy such defects within five (5) days or within any other period of time which has been agreed in writing, or to comply with the terms of the warranty and guarantee, then the Owner may have the defects corrected and the Contractor and the Contractor's Surety shall be liable for all expenses incurred. If the defect needs immediate correction, e.g., A/C system fails causing possible dismissal of school, then the Owner will contact the Contractor, Subcontractor, Sub-subcontractor, or manufacturer (whichever applies), advise them of the defect and make repairs. An itemized list of labor and materials with certified payrolls and material invoices will be forwarded to the Contractor for payment.

ARTICLE 12

OPERATION AND STORAGE AREAS

12.1 Contractor's Use of Premises: The Contractor will operate and maintain operations areas and associated storage areas at the Project site in accordance with the following:

12.1.1 All Contractor operations, including storage of materials and employee parking upon the Project site, shall be confined to areas designated by the Owner.

12.1.2 The Contractor may erect temporary buildings at its expense, which shall remain its property. The Contractor shall remove such buildings and associated utilities service lines upon completion of the Project, unless the Contractor requests and the Owner provides written consent that it may abandon such buildings and utilities in place.

12.1.3 The Contractor will use only established roadways, or construct and use such temporary roadways as may be authorized by the Owner. Load limits of vehicles shall not exceed the limits prescribed by appropriate regulations or law. The Contractor will provide protection to existing and new road surfaces, curbs, sidewalks, trees, shrubbery, sprinkler systems, drainage structures and other like existing and new improvements to prevent damage. Any damage thereto shall be repaired by, and at the expense of, the Contractor.

12.1.4 The Owner may restrict the Contractor's entry to the Project site to specifically assigned entrances and routes.

12.2 Contractor's Maintenance of Premises: The Contractor shall at all times keep the Project site free from

the accumulation of waste, waste materials, rubbish, or construction debris during performance of Work.

12.2.1 During the period of construction, and not less frequently than once a week, the Contractor shall remove from the Project site any and all waste materials, rubbish, construction debris and trash; and shall dispose of such waste materials, rubbish, construction debris and trash off the property of the Owner. The Contractor shall mow and trim the grass within the Project site at least every other week throughout the entire Contract Time.

12.2.2 Prior to the Contractor's requested date for a Pre-Final Inspection, the Contractor shall remove any and all remaining equipment from the Project site and shall leave the premises in a clean, neat and workmanlike condition satisfactory to the Owner.

CERTIFICATE OF NO ASBESTOS, PCB AND LEAD

That the undersigned does hereby certify that to the best of its information, knowledge and belief no asbestos, materials containing asbestos or polychlorinated biphenyl (PCB) have been used or incorporated into the Work; and that no lead or lead bearing materials have been used or incorporated into the potable water systems of the Work during the construction of **Cimarron Elementary School HVAC Upgrades and Replacement** for the Galena Park Independent School District under contract, dated **## day of MMM in the year 2019**.

EXECUTED this ____ day of _____.

Name of Company: **Contractor Name**

Printed Name: _____

Signature: _____

Title: _____

STATE OF TEXAS
COUNTY OF _____

BEFORE ME, the undersigned authority, on this day personally appeared _____ of _____ known to me to be the person and officer whose name is subscribed to the foregoing instrument and acknowledged to me that he executed the same for the purposes therein expressed and in the capacity therein stated. Given under my hand and seal of office, this the ____ day of _____.

My Commission Expires:

Notary Public – State of Texas

Typed or Printed Name

CB - SUPPLEMENTARY CONDITIONS TO THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The following supplements modify the “Galena Park Independent School District General Conditions for the Contract for Construction”. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in full force and effect.

ARTICLE 2 – LAWS GOVERNING CONSTRUCTION

2.2 Wage Rates: Davis-Bacon Act WD # TX20220253

General Decision Number: TX20220253 04/22/2022

Superseded General Decision Number: TX20210253

State: Texas

Construction Type: Building

County: Harris County in Texas.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

<p>If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:</p>	<ul style="list-style-type: none"> • Executive Order 14026 generally applies to the contract. • The contractor must pay all covered workers at least \$15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2022.
<p>If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:</p>	<ul style="list-style-type: none"> • Executive Order generally applies to the contract. • The contractor must pay all covered workers at least \$11.25 per hour (or the applicable wage rate listed on this wage determination if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Modification Number Publication Date

0	01/07/2022
1	01/21/2022
2	02/18/2022
3	02/25/2022
4	03/11/2022
5	04/22/2022

ASBE0022-009 06/01/2021

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR (Duct, Pipe and Mechanical System Insulation) -----	\$ 25.14	15.15
BOIL 0074-003 01/01/2021		
BOILERMAKER -----	\$ 29.47	24.10
* CARP0551-008 04/01/2021		
CARPENTER (Excludes Acoustical Ceiling Installation, Drywall Hanging, Form Work and Metal Stud Installation) -----	\$ 25.86	9.08
ELEC0716-005 08/30/2021		
ELECTRICIAN (Excludes Low Voltage Wiring and Installation of Alarms) -----	\$ 33.20	10.37
ELEV0031-003 01/01/2022		
ELEVATOR MECHANIC -----	\$ 47.04	36.885 ^{+a+b}

FOOTNOTES:

- A. 6% under 5 years based on regular hourly rate for all hours worked. 8% over 5 years based on regular hourly rate for all hours worked.
- B. Holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Friday after Thanksgiving Day; Christmas Day; and Veterans Day.

ENGI0450-002 04/01/2014

POWER EQUIPMENT OPERATOR: Cranes -----	\$ 34.85	9.85
---	----------	------

IRON0084-001 06/01/2021

IRONWORKER, STRUCTURAL -----	\$ 26.01	7.56
---------------------------------	----------	------

IRON0084-012 06/01/2021

Galena Park ISD

Facilities Planning

GLAZIER	\$ 23.27	7.12
IRONWORKER, ORNAMENTAL	\$ 26.01	7.56

PLAS0783-001 04/01/2021		
PLASTERER	\$ 26.04	9.02

PLUM0068-002 10/01/2021		
PLUMBER	\$ 36.83	11.71

PLUM0211-010 10/01/2021		
PIPEFITTER (Including HVAC Pipe Installation)	\$ 37.03	12.56

SFTX0669-002 04/01/2021		
SPRINKLER FITTER (Fire Sprinklers)	\$ 31.68	22.50

SHEE0054-006 04/01/2020		
SHEET METAL WORKER (Excludes HVAC Unit Installation)	\$ 29.70	13.85
HVAC Duct Installation Only	\$ 29.70	13.85

* SUTX2014-029 07/21/2014		
ACOUSTICAL CEILING MECHANIC	\$ 17.27	3.98
BRICKLAYER	\$ 18.87	0.00
CAULKER	\$ 15.36	0.00
CEMENT MASON/CONCRETE FINISHER	\$ 13.93 **	0.00
DRYWALL FINISHER/TAPER	\$ 16.27	3.66
DRYWALL HANGER AND METAL STUD INSTALLER	\$ 17.44	3.93
ELECTRICIAN (Alarm Installation Only)	\$ 17.97	3.37
ELECTRICIAN (Low Voltage Wiring Only)	\$ 18.00	1.68
FLOOR LAYER: Carpet	\$ 20.00	0.00
FORM WORKER	\$ 12.77 **	0.00
INSULATOR – BATT	\$ 14.87 **	0.73
IRONWORKER, REINFORCING	\$ 12.14 **	0.00

Galena Park ISD**Facilities Planning**

LABORER: Common or General	\$ 11.76 **	0.00
LABORER: Mason Tender – Brick	\$ 13.47 **	0.00
LABORER: Mason Tender - Cement/Concrete	\$ 10.48 **	0.00
LABORER: Pipe layer	\$ 12.94 **	0.00
LABORER: Roof Tear off	\$ 11.28 **	0.00
LABORER: Landscape and Irrigation	\$ 9.52 **	0.00
LATHER	\$ 19.73	0.00
OPERATOR: Backhoe/Excavator/Trackhoe	\$ 13.94 **	0.00
OPERATOR: Bobcat/Skid Steer/Skid Loader	\$ 13.93 **	0.00
OPERATOR: Bulldozer	\$ 22.75	0.00
OPERATOR: Drill	\$ 16.22	0.34
OPERATOR: Forklift	\$ 16.00	0.00
OPERATOR: Grader/Blade	\$ 13.37 **	0.00
OPERATOR: Loader	\$ 13.55 **	0.94
OPERATOR: Mechanic	\$ 17.52	3.33
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	\$ 16.03	0.00
OPERATOR: Roller	\$ 16.00	0.00
PAINTER (Brush, Roller and Spray), Excludes Drywall Finishing/Taping	\$ 17.24	4.41
ROOFER	\$ 15.40	0.00
SHEET METAL WORKER (HVAC Unit Installation Only)	\$ 20.05	2.24
TILE FINISHER	\$ 12.00 **	0.00
TILE SETTER	\$ 16.17	0.00
TRUCK DRIVER: 1/Single Axle Truck	\$ 14.18 **	0.00
TRUCK DRIVER: Dump Truck	\$ 12.39 **	1.18
TRUCK DRIVER: Flatbed Truck	\$ 19.65	8.57

Galena Park ISD

Facilities Planning

TRUCK DRIVER: Semi-Trailer Truck	\$ 12.50 **	0.00
TRUCK DRIVER: Water Truck	\$ 12.00 **	4.11
WATERPROOFER	\$ 14.39 **	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.
=====

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$15.00) or 13658 (\$11.25). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four-letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is

the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
 Wage and Hour Division
 U.S. Department of Labor
 200 Constitution Avenue, N.W.
 Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
 U.S. Department of Labor
 200 Constitution Avenue, N.W.
 Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====
END OF GENERAL DECISION"

ARTICLE 3 – CONTRACT DOCUMENTS AND BONDS

Copies Furnished: Drawings and the Project Manual: The Contractor will be furnished free of charge 3 sets of the Drawings and Project Manual. Additional sets will be furnished at the cost of reproduction, postage and handling.

SAMPLE

ARTICLE 4 – CONTRACT ADMINISTRATION

Subcontracts:

The Contractor shall contract only with subcontractors for the Mechanical, Plumbing, Electrical, Security. Fire Alarm and P.A. Systems per the following: None

ARTICLE 5 – CONTRACT RESPONSIBILITIES:

The existing site and buildings are considered in good condition. The selected contractor shall document through the use of video or camera media any existing defects (including, but not limited to, staging and site work areas) prior to the start of any construction. Copies of the videotapes or photographs must be filed with the Architect and Owner prior to the start of any construction. Any and all defects not specifically identified prior to construction shall be repaired/replaced to the satisfaction of the Owner at no additional cost to the Owner.

ARTICLE 8 – CONTRACT COMPLETION TIME:

8.1 **Notice to Proceed:** Add the following: The following Schedule is for approval and execution of the Standard Form of Agreement between Owner and Contractor. These dates are planned and subject to changes. The GPISD will make every attempt to maintain the schedule; however, if revisions are required to activities controlled by the Owner which delay the issuance of the “Notice to Proceed”, then the Date of Substantial Completion will be revised by maintaining the same durations for construction.

<u>Activity</u>	<u>Responsibility</u>	<u>Dates</u>
.1 Prepare and forward to Contractor	Owner	##/##/####
.2 Contractor execution	Contractor	##/##/####
.3 Board of Trustees Approval and Execution	Owner	##/##/####
.4 Contractor obtain bonds & Insurance	Contractor	##/##/####
.5 Issue “Notice to Proceed”	Owner	##/##/####
.6 Date of Substantial Completion	Contractor	##/##/####

Liquidated Damages: Add the following: Time is of the essence of this Contract. Contractor acknowledges and agrees that its failure to complete the Work within the Contract Time shall cause damage to the Owner, and further agrees that the amount of such damage cannot be accurately measured or is difficult to ascertain. Therefore, Contractor agrees that for each and every calendar day the Work or any portion thereof shall remain uncompleted after the expiration of the Contract Time Contractor shall pay to Owner as Liquidated Damages the sum of \$2,500.00 per calendar day. Owner shall have the right to withhold and deduct the amount of any or all such damages from any moneys owned to the Contractor.

CC - SPECIAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The following are special conditions of the Galena Park Independent School District Contract for Construction.


SCHOOL SCHEDULE

The Owner currently plans the following school operations on or near the site of the Work during the Contract Time:

1. Full school operations will be conducted at the school during the normal school year. During the summer vacation, limited school operations will be conducted.
2. The Contractor shall not perform any work during the week of the STAAR and/or EOC testing. Refer to the attached schedule.
3. When school is in session, if the Contractor is going to work during time periods listed below, then the Contractor will include in its Base Proposal the cost of a GPISD employee at the rate of \$50.00 per hour to operate the security system and provide access to the facility.
 - a. Prior to 7:00 AM, after 11:00 PM.
 - b. Weekends - refer to attached schedule.
 - c. Holidays - refer to attached schedule
4. The Contractor shall recognize the critical need for safety of all persons involved in the school program, and the need to conduct construction operations in such a way as to minimize disruption of school program operation. Contractor understands that it is the obligation of the Contractor to protect the Work, materials and equipment from vandalism and theft, and that it cannot rely on school security personnel to perform this function.
5. Critical areas and systems including, but not limited to, air conditioning system, electrical system and kitchen must remain functional at all times while the school is in operation. Any renovation work that would require a shut down of these items must be accomplished during vacations, holidays, or at other times when the school is not operating.

CRIMINAL HISTORY

Contractors shall obtain state or national criminal history records of employees who will work at the Sites as required by the Texas Senate Bill 9. If Contractor does not have access to the criminal history records of employees who will work at the Sites, Contractor shall ensure such employees cooperate and submit all information necessary for District's LEE Fast Pass procedure.



GALENA PARK

INDEPENDENT SCHOOL DISTRICT

2019-20 School Calendar

July 2019

Sun	Mon	Tues	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

August 2019

Sun	Mon	Tues	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

September 2019

Sun	Mon	Tues	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

October 2019

Sun	Mon	Tues	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

November 2019

Sun	Mon	Tues	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

December 2019

Sun	Mon	Tues	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

LEGEND

Student Holiday/Staff Development
 Early Dismissal - High Schools Only
 Bad Weather Make-up Days

Holidays

Important Dates

August 21 First Day of School
May 28 Last Day of School

New Teacher Orientation

July 31
August 1 - 2
August 9

Student Holiday/Staff Development

August 5 - 8 Two Day Academy
August 12 - 20
October 11
January 6
February 14
May 29

Staff Development Flex Days (Options)

August 17, September 7, October 26, April 4, May 2, May 9

Holidays

September 2 Labor Day
October 14 Columbus Day
November 25 - 29 Thanksgiving
December 23 - January 3 Winter Break
January 20 M. L. King Jr. Day
February 17 Presidents' Day
March 9 - 13 Spring Break
April 10 - 13 Easter Break
May 25 Memorial Day

Six Weeks Grading Period

High Schools Report Card Dates

First Semester

1. Aug. 21 - Sept. 27 (27 days) Oct. 4
2. Sept. 30 - Nov. 1 (23 days) Nov. 8
3. Nov. 4 - Dec. 20 (30 days) Jan. 10

Second Semester

4. Jan. 7 - Feb. 21 (31 days) Feb. 28
5. Feb. 24 - Apr. 9 (29 days) Apr. 17
6. Apr. 14 - May 28 (32 days) June 5

Nine Weeks Grading Period

Elementary/Middle Schools Report Card Dates

First Semester

1. Aug. 21 - Oct. 18 (40 days) Oct. 25
2. Oct. 21 - Dec. 20 (40 days) Jan. 10

Second Semester

3. Jan. 7 - Mar. 20 (46 days) Mar. 27
4. Mar. 23 - May 28 (46 days) May 28 ES/June 5 MS

State Testing Days

Dec. 10 - 12 End of Course Testing
April 7 - 9 STAAR/End of Course Testing
May 5 - 15 STAAR/End of Course/AP Testing
June 23 - 25 STAAR/End of Course Retest

(Subject to change if required by TEA)

January 2020

Sun	Mon	Tues	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

February 2020

Sun	Mon	Tues	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

March 2020

Sun	Mon	Tues	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

April 2020

Sun	Mon	Tues	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

May 2020

Sun	Mon	Tues	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

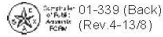
June 2020

Sun	Mon	Tues	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

*****INSERT DISTRICT CALENDAR HERE*****

SAMPLE

CD - TEXAS SALES AND USE TAX EXEMPTION CERTIFICATION



SAVE A COPY

CLEAR SIDE

Texas Sales and Use Tax Exemption Certification

This certificate does not require a number to be valid.

Name of purchaser, firm or agency	
Address (Street & number, P.O. Box or Route number)	Phone (Area code and number)
City, State, ZIP code	

I, the purchaser named above, claim an exemption from payment of sales and use taxes (for the purchase of taxable items described below or on the attached order or invoice) from:

Seller: _____


Street address: _____ City, State, ZIP code: _____

Description of items to be purchased or on the attached order or invoice:

Purchaser claims this exemption for the following reason:

I understand that I will be liable for payment of all state and local sales or use taxes which may become due for failure to comply with the provisions of the Tax Code and/or all applicable law.

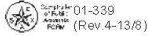
I understand that it is a criminal offense to give an exemption certificate to the seller for taxable items that I know, at the time of purchase, will be used in a manner other than that expressed in this certificate, and depending on the amount of tax evaded, the offense may range from a Class C misdemeanor to a felony of the second degree.

 Purchaser	Title	Date
---	-------	------

NOTE: This certificate cannot be issued for the purchase, lease, or rental of a motor vehicle.
THIS CERTIFICATE DOES NOT REQUIRE A NUMBER TO BE VALID.
 Sales and Use Tax "Exemption Numbers" or "Tax Exempt" Numbers do not exist.

**This certificate should be furnished to the supplier.
 Do not send the completed certificate to the Comptroller of Public Accounts.**

CD - TEXAS SALES AND USE TAX RESALE CERTIFICATE



SAVE A COPY CLEAR SIDE

Texas Sales and Use Tax Resale Certificate

Name of purchaser, firm or agency as shown on permit Phone (Area code and number) Address (Street & number, P. O. Box or Route number) City, State, ZIP code Texas Sales and Use Tax Permit Number (must contain 11 digits) Out-of-state retailer's registration number or Federal Taxpayers Registry (RFC) number for retailers based in Mexico (Retailers based in Mexico must also provide a copy of their Mexico registration form to the seller.)

I, the purchaser named above, claim the right to make a non-taxable purchase (for resale of the taxable items described below or on the attached order or invoice) from: Seller: Street address: City, State, ZIP code: Description of items to be purchased on the attached order or invoice: Description of the type of business activity generally engaged in or type of items normally sold by the purchaser: The taxable items described above, or on the attached order or invoice, will be resold, rented or leased by me within the geographical limits of the United States of America, its territories and possessions or within the geographical limits of the United Mexican States, in their present form or attached to other taxable items to be sold. I understand that if I make any use of the items other than retention, demonstration or display while holding them for sale, lease or rental, I must pay sales tax on the items at the time of use based upon either the purchase price or the fair market rental value for the period of time used. I understand that it is a criminal offense to give a resale certificate to the seller for taxable items that I know, at the time of purchase, are purchased for use rather than for the purpose of resale, lease or rental, and depending on the amount of tax evaded, the offense may range from a Class C misdemeanor to a felony of the second degree.

sign here Purchaser Title Date

This certificate should be furnished to the supplier. Do not send the completed certificate to the Comptroller of Public Accounts.

TABLE OF CONTENTS

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- 00 02 00 INVITATION TO BID
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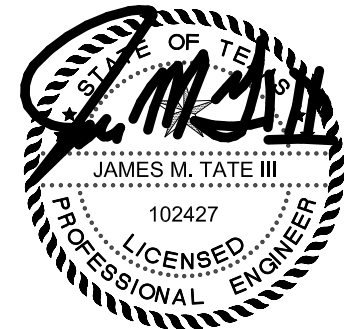
- 02 07 00 SELECTIVE DEMOLITION

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07-18-2022

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DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS

SECTION 00 02 00 - INVITATION TO BID

PROJECT: CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT, GALENA PARK INDEPENDENT SCHOOL DISTRICT

PROJECT NUMBER: 3 001 0537 001

BID DATE AND TIME: Tuesday, August 9, 2022, 2:00 p.m.

Opening Of Bids: Galena Park Independent School District
14705 Woodforest Boulevard
Houston, Texas 77015

ENGINEER: EMA Engineering & Consulting
328 South Broadway Avenue
Tyler, Texas 75702 (Phone: 903-581-2677)

The Galena Park ISD Board of Trustees has selected competitive sealed proposals as the project delivery/contract method to be used for this project.

Competitive Sealed Proposals are requested for the ***Cimarron Elementary School HVAC Upgrades and Replacement, Galena Park Independent School District.***

Scope of work includes: HVAC Renovations and Indoor Air Quality Improvements.

Sealed proposals will be received by Galena Park ISD at the following location: 14705 Woodforest Blvd., Houston, Texas 77015. Proposals received after bid date and time will not be accepted. All interested parties are invited to attend. Proposals will be opened publicly and read aloud.

Electronic drawings and specifications may be obtained from the Galena Park Independent School District website.

Bid Security in the amount of 5% of proposal must accompany each bid in accordance with the Instructions to Bidders. The successful bidders shall provide Payment and Performance Bonds.

All Contractors shall comply with prevailing wage rates in accordance with the civil statutes of the State of Texas and Department of Labor.

Davis-Bacon Act requires payment of prevailing wages to various classes of laborers and mechanics. Certified payrolls are required for this project and shall comply with U.S. Department of Labor Form WH-347.

The Owner reserves the right to waive irregularities and to reject any or all Bids. The Galena Park Independent School District reserves the right to separate or eliminate any item it deems necessary to accommodate budgetary and/or operational requirements. The Galena Park Independent School District also reserves the right to reject any or all Bids or parts of the Bids, and waiver all formalities, and to award this Bid in the best interest of the Galena Park Independent School District. The Galena Park Independent School District also reserves the right to award to other than the lowest bidder under statutory mandate 2267.055 Government Code.

The General Contractor shall be a Mechanical Contractor and shall have been in business seven continuous years under the company bidding this project. Specific related school experience is required. All Bidders shall visit the job site before submitting bid. Bid Bond, Performance Bond, and Labor and Material Payment Bond are required of the General Contractor.

The Mechanical Contractor shall be required to provide Bid Bond and Payment and Performance Bond as specified herein.

See qualifications of Mechanical Contractor in specifications.

The Bid Security will not be returned until all bonds are provided.

The successful bidder shall be required to attend the pre-construction conference prior to the beginning of the work.

Bidders shall submit a detailed schedule of construction as well as a staffing plan. Bidders shall define contingency measures if there are delays in equipment orders that prevent the project completion on schedule.

SELECTION CRITERIA: In accordance with Texas Education Code as amended, Galena Park Independent School District shall evaluate all proposals based on a combination of factors that the Galena Park ISD determines provides the best value to the District including:

- | | |
|--|-----------|
| 1. Price; | 35 points |
| 2. Proposer's experience and reputation; | 30 points |
| 3. Proposer's past performance and quality of work; | 5 points |
| 4. Proposer's personnel to be assigned to the project; | 5 points |
| 5. Conformance with proposed contract document requirements; | 5 points |
| 6. Proposed warranty coverage; | 15 points |
| 7. Impact on the ability of the district to comply with existing | 5 points |
| a. laws related to historically underutilized, women owned, | |
| b. small, or disadvantaged businesses. | |

A Pre-Bid Conference will be held August 1, 2022, at 9:00 a.m., at the Galena Park Independent School District Administration Building. It is highly recommended that companies submitting proposals attend.

Galena Park ISD encourages the participation of qualified historically underutilized businesses.

Galena Park Independent School District
John C. Moore
Superintendent

WAGE DETERMINATIONS

Davis-Bacon Act WD # TX20220253

Wage Determination

Modification

6

Construction

Building

Last Revised Date

Jul 08, 2022

States and Counties

State

Texas

Counties

Harris

Document

"General Decision Number: TX20220253 07/08/2022

Superseded General Decision Number: TX20210253

State: Texas

Construction Type: Building

County: Harris County in Texas.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022: 	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2022.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022: 	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Modification Number	Publication Date
0	01/07/2022
1	01/21/2022
2	02/18/2022
3	02/25/2022
4	03/11/2022
5	04/22/2022
6	07/08/2022

ASBE0022-009 06/01/2021

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR (Duct, Pipe and Mechanical System Insulation).....	\$ 25.14	15.15

BOIL0074-003 01/01/2021

	Rates	Fringes
BOILERMAKER.....	\$ 29.47	24.10

CARP0551-008 04/01/2021

	Rates	Fringes
CARPENTER (Excludes Acoustical Ceiling Installation, Drywall Hanging, Form Work and Metal Stud Installation).....	\$ 25.86	9.08

ELEC0716-005 08/30/2021

	Rates	Fringes
ELECTRICIAN (Excludes Low Voltage Wiring and Installation of Alarms).....	\$ 33.20	10.37

ELEV0031-003 01/01/2022

	Rates	Fringes
ELEVATOR MECHANIC.....	\$ 47.04	36.885+a+b

FOOTNOTES:

A. 6% under 5 years based on regular hourly rate for all hours worked. 8% over 5 years based on regular hourly rate for all hours worked.

B. Holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Friday after Thanksgiving Day; Christmas Day; and Veterans Day.

ENGI0450-002 04/01/2014

Rates Fringes

POWER EQUIPMENT OPERATOR

Cranes.....\$ 34.85 9.85

IRON0084-001 06/01/2021

Rates Fringes

IRONWORKER, STRUCTURAL.....\$ 26.01 7.56

IRON0084-012 06/01/2021

Rates Fringes

GLAZIER.....\$ 23.27 7.12

IRONWORKER, ORNAMENTAL.....\$ 26.01 7.56

PLAS0783-001 04/01/2021

Rates Fringes

PLASTERER.....\$ 26.04 9.02

PLUM0068-002 10/01/2021

Rates Fringes

PLUMBER.....\$ 36.83 11.71

PLUM0211-010 10/01/2021

Rates Fringes

PIPEFITTER (Including HVAC Pipe Installation).....\$ 37.03 12.56

SFTX0669-002 04/01/2021

Rates Fringes

SPRINKLER FITTER (Fire Sprinklers).....\$ 31.68 22.50

SHEE0054-006 04/01/2020

Rates Fringes

SHEET METAL WORKER

Excludes HVAC Unit

Installation.....	\$ 29.70	13.85
HVAC Duct Installation Only..	\$ 29.70	13.85

* SUTX2014-029 07/21/2014

	Rates	Fringes
ACOUSTICAL CEILING MECHANIC.....	\$ 17.27	3.98
BRICKLAYER.....	\$ 18.87	0.00
CAULKER.....	\$ 15.36	0.00
CEMENT MASON/CONCRETE FINISHER...\$	13.93 **	0.00
DRYWALL FINISHER/TAPER.....\$	16.27	3.66
DRYWALL HANGER AND METAL STUD INSTALLER.....	\$ 17.44	3.93
ELECTRICIAN (Alarm Installation Only).....	\$ 17.97	3.37
ELECTRICIAN (Low Voltage Wiring Only).....	\$ 18.00	1.68
FLOOR LAYER: Carpet.....	\$ 20.00	0.00
FORM WORKER.....	\$ 12.77 **	0.00
INSULATOR - BATT.....	\$ 14.87 **	0.73
IRONWORKER, REINFORCING.....	\$ 12.14 **	0.00
LABORER: Common or General.....	\$ 11.76 **	0.00
LABORER: Mason Tender - Brick...\$	13.47 **	0.00
LABORER: Mason Tender - Cement/Concrete.....	\$ 10.48 **	0.00
LABORER: Pipelayer.....	\$ 12.94 **	0.00
LABORER: Roof Tearoff.....	\$ 11.28 **	0.00

LABORER: Landscape and

Irrigation.....	\$ 9.52 **	0.00
LATHER.....	\$ 19.73	0.00
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 13.94 **	0.00
OPERATOR: Bobcat/Skid Steer/Skid Loader.....	\$ 13.93 **	0.00
OPERATOR: Bulldozer.....	\$ 22.75	0.00
OPERATOR: Drill.....	\$ 16.22	0.34
OPERATOR: Forklift.....	\$ 16.00	0.00
OPERATOR: Grader/Blade.....	\$ 13.37 **	0.00
OPERATOR: Loader.....	\$ 13.55 **	0.94
OPERATOR: Mechanic.....	\$ 17.52	3.33
OPERATOR: Paver (Asphalt, Aggregate, and Concrete).....	\$ 16.03	0.00
OPERATOR: Roller.....	\$ 16.00	0.00
PAINTER (Brush, Roller and Spray), Excludes Drywall Finishing/Taping.....	\$ 17.24	4.41
ROOFER.....	\$ 15.40	0.00
SHEET METAL WORKER (HVAC Unit Installation Only).....	\$ 20.05	2.24
TILE FINISHER.....	\$ 12.00 **	0.00
TILE SETTER.....	\$ 16.17	0.00
TRUCK DRIVER: 1/Single Axle Truck.....	\$ 14.18 **	0.00
TRUCK DRIVER: Dump Truck.....	\$ 12.39 **	1.18
TRUCK DRIVER: Flatbed Truck.....	\$ 19.65	8.57
TRUCK DRIVER: Semi-Trailer Truck.....	\$ 12.50 **	0.00

TRUCK DRIVER: Water Truck.....	\$ 12.00 **	4.11
WATERPROOFER.....	\$ 14.39 **	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

=====

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$15.00) or 13658 (\$11.25). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular

rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the

classifications was union data. EXAMPLE: UAVG-OH-0010
08/29/2014. UAVG indicates that the rate is a weighted union
average rate. OH indicates the state. The next number, 0010 in
the example, is an internal number used in producing the wage
determination. 08/29/2014 indicates the survey completion date
for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of
each year, to reflect a weighted average of the current
negotiated/CBA rate of the union locals from which the rate is
based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can
be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on
a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests
for summaries of surveys, should be with the Wage and Hour
National Office because National Office has responsibility for
the Davis-Bacon survey program. If the response from this
initial contact is not satisfactory, then the process described
in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal
process described here, initial contact should be with the
Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an
interested party (those affected by the action) can request
review and reconsideration from the Wage and Hour Administrator
(See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====

END OF GENERAL DECISION"

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
GALENA PARK INDEPENDENT SCHOOL DISTRICT**

SECTION 01 00 00

GENERAL REQUIREMENTS

- 1. Work Included: Furnishing of all coordination, labor, superintendence, materials, tools, cranes, equipment and sources necessary for the complete installation or modification of the following systems as shown on the plans and as herein specified. It is the intent of these specifications that the Contractor shall furnish and install a system complete in every respect and ready to operate. All miscellaneous items and accessories required for such installation and for the correct and convenient operation of the entire installation whether or not each such item or accessory is shown on the plans or mentioned in these specifications shall be furnished and installed. Drawings and Division 0 apply to this Section.

- 2. Codes, Standards, and Permits: Comply with all local requirements. All work shall be in strict accordance with all applicable laws and codes, including but not limited to the following:
 - a. National Electrical Code; Latest Edition
 - b. Occupational Safety and Health Administration Standards including (but not limited to) OSHA Standard 2207 - Construction Industry Standards
 - c. Applicable State Codes & Laws
 - d. City Codes and Code Modifications, & Adopted Codes & Ordinances.
 - e. National Fire Protection Association
 - f. Texas Department of Health
 - g. Standard Building Code - 1994 Edition
 - h. Vernon's Law - State of Texas
 - i. Standard Mechanical Code - 1994 Edition
 - j. Standard Plumbing Code - 1994 Edition
 - k. Environmental Protection Agency
 - l. Standard Gas Code - 1994 Edition
 - m. Texas Department of Labor Boiler Rules and Regulations
 - n. NFPA 90A
 - o. American Society of Heating, Refrigerating, and Air Conditioning Engineers.
 - p. Clean Air Act and Amendments.

Nothing in the plans or specifications shall be construed to permit work not conforming to these codes. In all cases of difference between minimum requirements of the various laws, codes and authorities, it is intended that the work shall meet the more stringent requirements.

The Contractor shall procure all necessary permits or licenses to carry out his work and pay the lawful fees therefore; he shall also obtain and pay for all the necessary certificates of approval which must be delivered to the Owner before final acceptance of the work.

The Contractor and Subcontractors shall contact the City and obtain and verify all codes, ordinances, and regulations before beginning work. The Contractor and Subcontractors are responsible for complying with all codes, ordinances, and regulation requirements, and ensuring that current codes are used.

- 3. Guarantee: The Contractor shall guarantee his work against defective materials and workmanship for a period of one year from date of acceptance of the job. Neither the final payment nor any provisions in Contract documents shall relieve the Contractor of the

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
GALENA PARK INDEPENDENT SCHOOL DISTRICT**

1 responsibility for faulty materials and workmanship; he shall remedy any defects due
2 thereto, and pay for any damage to other work resulting therefrom, which shall appear within
3 a period of one year from date of substantial completion.
4

5 4. Submittals: The Contractor shall submit to the Engineer for review six copies of the material
6 to be used on this job. This submittal shall include all data as well as the manufacturer's
7 name and catalog number.
8

9 The review of such plans shall not relieve the Contractor of responsibility for deviation from
10 the Contract plans or specifications.
11

12 Shop drawings and samples per General Conditions. Contractor shall submit shop drawings
13 and samples accompanied by transmittal forms.
14

15 Construction schedule per General Conditions shall be submitted.
16

17 5. Project Closeout:
18

19 Cleaning Up: Upon completion of the work, remove surplus materials and rubbish of every
20 kind from the site of the work.
21

22 Documents Required Prior to Final Payment: Prior to final payment, and before the issuance
23 of a final certificate for payment in accordance with the provisions of the NSPE General
24 Conditions, file the following notarized papers with the Engineer.
25

26 Documents:

27 Final Certificate for Payment

28 Contractor's Affidavit of Payment of Debts and Claims (AIA G706)

29 Contractor's Affidavit of Release of Liens (AIA G706A)

30 Release of Claims and Waiver of Lien for Subcontractor, Materialmen or Material
31 Fabricators.
32

33 Guarantees: The guarantee required by the General Conditions and any other extended
34 guarantee stated in the technical sections of the specifications. Start date of warranty shall
35 be the date of final completion.
36

37 Operation and Maintenance Manuals: Furnish as specified under the various sections of the
38 Specifications.
39

40 Asbestos certification letter that no asbestos was provided in this project.
41

42 Project Record Documents: As the work progresses, keep a complete and accurate record
43 of changes or deviations from the Contract Documents and the shop drawings, indicating
44 the work as actually installed. Changes shall be neatly and correctly shown on the respective
45 portion of the affected document, using blue line prints of the Drawings affected or the
46 Specifications, with appropriate supplementary notes. This record set of Drawings, shop
47 drawings, and Specifications shall be kept at the job site for inspection by the Engineer and
48 Owner.
49

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
GALENA PARK INDEPENDENT SCHOOL DISTRICT**

1 The records above shall be arranged in order, in accordance with the various sections of
2 the specifications, and properly indexed. At the completion of the work, certify by
3 endorsement thereon that each of the revised prints of the Drawings and Specifications is
4 complete and accurate. Prior to application for final payment, and as a condition to its
5 approval by the Engineer and Owner, deliver the record set of Drawings and Specifications,
6 arranged in proper order, indexed, and endorsed as hereinbefore specified.
7

8 No review or receipt of such records by the Engineer or Owner shall be a waiver of any
9 deviation from the Contract Documents or the shop drawings or in any way relieve the
10 Contractor from his responsibility to perform the work in accordance with the Contract
11 Documents and the shop drawings to the extent that they are in accordance with the
12 Contract Documents.
13

14 6. The project site shall be kept free of accumulation of surplus materials and rubbish during
15 construction. Upon the completion of the project all debris shall be removed and the site
16 shall be left clean. During the school term the contractor and subcontractors shall clean-up
17 daily the area where work is performed. If it is necessary for the school to clean up after the
18 contractor or subcontractor, the Owner reserves the right to keep track of costs and bill the
19 Contractor. The Contractor and Subcontractors shall cooperate with the school.
20

21 7. Asbestos:
22 Asbestos work is specifically excluded from this contract. The Contractor and
23 Subcontractors shall communicate directly and separately from the Engineer with Owner in
24 all decisions involving asbestos or whether a material is asbestos.
25

26 8. The Division 0, Division 23, Division 26, and General Provisions Division - 1 supplement
27 and modify the Contract Documents and shall form a part of the Contract and all
28 Subcontracts.
29

30 9. The project site shall be cleaned-up before final inspection and payment.
31

32 10. All trades shall have proper licenses as required by the City where the project is located. It
33 is the responsibility of the General Contractor to verify that all subcontractors have proper
34 required licenses.
35

36 11. Special Site Conditions:
37 a. All work is to be carried out as quietly and dust free as possible. Noise, vibration,
38 and disturbance shall be kept to a minimum and work shall be accomplished in
39 accordance with local ordinances. Keep the premises free of accumulations of
40 surplus materials and rubbish, and in an orderly condition at all times.
41 b. In the event any work is accomplished during the school year when classes are in
42 session, or during office hours, work shall be conducted in a manner that will not
43 interfere with, be disruptive, or distracting to the classes or office. Contractor work
44 schedules during the school term and office hours shall be coordinated with the
45 Owner's representative. Entrance to buildings after school hours or during times
46 when the building is normally closed is the responsibility of the Contractor. The
47 Contractor is responsible for obtaining keys or coordinating with school personnel to
48 obtain access and to secure the building. The Contractor shall become familiar with
49 space limitations and traffic patterns.

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
GALENA PARK INDEPENDENT SCHOOL DISTRICT**

1 The campus custodians are charged with having their buildings clean and ready for
2 school each day. The Contractor will be cognizant of this important factor and make
3 every effort to complete each area of construction in a timely manner to allow the
4 campus custodians to move in and complete their work. Contractor is responsible
5 for cleaning of their own related work.

6 c. Work accomplished during the non-regular school term and hours shall be
7 coordinated with Owner's Representative for building security, and routine school
8 cleaning and maintenance. Contractors shall coordinate and cooperate with Owner
9 to ensure building is ready for the next scheduled use. The Contractor shall be
10 responsible for building security and coordinating security with Owner's
11 Representative. The Contractor shall coordinate and cooperate with any school
12 activities and schedule.

13 d. The Owner reserves the right to have their personnel and other Contractors working
14 in the building. The Owner reserves the right to partially occupy the building in
15 completed areas prior to Completion.

16 e. Keep public areas such as halls, stairs, etc. free from accumulation of waste and
17 construction debris. Smoking or open fires will not be permitted within the building
18 enclosure or on the premises.

19 f. Use of the existing toilets within the building by the Contractor, and his personnel
20 will not be permitted.

21 g. Maintain the building in a safe and weather tight condition at all times.

22
23 12. Protection of Owner's Operations:

24
25 The Contractor is herewith advised that his operations and the operations of any and all
26 subcontractors will be required to be coordinated with the Owner. Other services shall be
27 limited to non-school hours. Temporary outages of electrical power and plumbing shall be
28 limited to non-school hours.

29
30 All buildings are equipped with burglar alarm systems. Any work to be done during off hours
31 will require notification of the Owner's representative three (3) days prior in order for the
32 Owner to arrange for disarming and rearming of burglar systems.

33
34 Should the Contractor damage Owner's utility lines or apparatus and the Owner be called
35 to make timely repairs, the Contractor will be invoiced based upon current Owner's overtime
36 expenses.

37
38 13. Contractor's Affidavit:

39
40 After completion of the work contemplated by this Contract, the Contractor shall file with the
41 Owner his affidavit, sworn to before a Notary Public, stating that all workmen and persons
42 employed, all firms supplying the materials and all subcontractors upon the project have
43 been paid in full and that there are no bills outstanding against the project for either labor or
44 materials, except certain items, if any, to be set forth in such affidavit covering disputed
45 claims.

46 The filing of such affidavit by the Contractor shall be prerequisite to the making by the Owner
47 of the final payment to the Contractor.
48

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- 1 14. Exposed conduit will not be allowed in occupied areas or spaces. Exposed conduit will not
2 be allowed in the halls below the ceiling. Exposed conduit in normally unoccupied areas will
3 be permitted only after approval of Engineer and Owner. Any exposed conduit permitted
4 shall be wiremold.
5
- 6 15. This project shall be accomplished in a neat and good workmanship manner using accepted
7 methods. Wiring, panels, etc. shall be neat and orderly in appearance. Loose, tangled wires,
8 etc. will not be accepted. The final work shall be complete and finished.
9
- 10 16. Each Contractor and Subcontractor is responsible for cleaning up and removing their own
11 debris, dust, trash, etc. Any damage to the school or school equipment or school supplies
12 requiring repair shall be accomplished by Contractor or Subcontractor doing damage.
13 Spillage, over spray, collections of dust and debris, and damage to Owner occupied spaces
14 shall be cleaned or remedied immediately by the responsible trade. Clean up all surfaces,
15 remove equipment, salvage and debris, and return in condition suitable for use by the Owner
16 as quickly as possible.
17
- 18 17. Asbestos and asbestos containing materials will not be allowed in this project. Upon
19 completion of the project the Contractor and all Subcontractors shall provide Owner with a
20 letter stating that no asbestos and asbestos containing materials were provided at the
21 projects.
22
- 23 18. All wiring shall be in metallic conduit. Conduit on the roof shall be an absolute minimum.
24
- 25 19. CONTINGENCY ALLOWANCE - To be included in Base Bid (See Bid Form). This
26 allowance is for contingencies and shall only be spent on prior written approval of Owner
27 and Engineer. At the end of the contract, unused contingency allowance shall be returned
28 to the Owner. Contingency allowance (dollars) and other allowances (dollars) may be
29 moved from one allowance to another allowance at the sole discretion of the Owner and
30 Engineer, and without any penalty to the Owner.
31
- 32 20. Cutting and Patching.
33
34 "Cutting and patching" includes cutting into existing construction to provide for the
35 installation or performance of other work and subsequent fitting and patching required to
36 restore surfaces to their original condition.
37
38 "Cutting and patching" is performed for coordination of the work, to uncover work for access
39 or inspection, to obtain samples for testing, to permit alterations to be performed or for other
40 similar purposes.
41
42 Do not cut structural members.
43
- 44 21. Schedule, Reports, Meetings, and Payments.
45
46 Contractor shall provide and keep current a construction schedule.
47
48 Contractor shall prepare a schedule of values on AIA forms. Payment schedule may be
49 submitted no more than one per month.
50

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1 After completion date, no partial payments will be made until all work is one-hundred percent
2 complete and accepted by Engineer and Owner.

- 3
4 22. Temporary construction and support facilities required for the project include but are not
5 limited to the following:

6
7 Sanitary facilities (school facilities shall not be used by contractor personnel)
8 Drinking water
9 Temporary enclosures and barricades as required
10 First aid station
11 Project identification, bulletin boards and all required local, state and federal signs
12 Waste disposal services
13 Rodent and pest control
14 Construction aids and miscellaneous general services and facilities
15 All excavation shall be properly filled at the end of each work day.

16
17 Security and protection facilities and services for the project include but are not limited to
18 the following:

19
20 Temporary fire protection
21 Barricades, warning signs, lights
22 Environmental protection
23 The Contractor shall not use the school telephones.
24 Any temporary heat required.

25
26 Hoists: The Contractor, when required, shall install and operate hoists for proper execution
27 of work. Location of hoists shall be approved by the Owner.

- 28
29 23. Protection of Roof

30
31 The Contractor and Subcontractors shall accomplish the work in such a manner so as to
32 protect the roof. The Contractor shall be responsible for any damage to the roof.

- 33
34 24. Protection of Carpet, Other Floor Coverings, Lockers, All Surfaces of School, School
35 Equipment & School Property

- 36
37 25. Protect the building and contents (security, rain, etc.) at all times. Provide all materials and
38 labor.

39
40 The Contractor shall protect all school surfaces, school equipment, and school property.
41 Any damage shall be repaired or replaced. Contractor shall also protect from scratches.
42 Contractor shall protect carpet, other floor coverings, lockers, all surfaces, all school
43 equipment and all school property. Contractor shall instruct all employees and
44 subcontractors to protect the school. Any ceilings or ceiling tiles damaged shall be replaced
45 with identical.

- 46
47 26. The Contractor shall be responsible for and insure that the mechanical equipment, controls,
48 and electrical work are fully compatible and coordinated.

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1 27. Quality Control & Workmanship

2
3 Maintain quality control and supervision over subcontractors, suppliers, manufacturers,
4 products, services, site conditions, and workmanship to produce work of specified quality.
5 Perform all work to the level of quality by Standards in individual Specification Section. All
6 work may be inspected by the Engineer and Owner's Representative for compliance with
7 approved submittals and level of quality specified. The Work, or any part of the Work,
8 deemed unsuitable or below the required level quality by the Engineer or Director of
9 Maintenance shall be replaced or repaired by the Contractor at no additional cost to the
10 Owner.

11
12 Comply with industry standards required for high quality commercial and institutional
13 buildings, except when more restrictive tolerances or specified requirements indicate more
14 rigid standards or more precise workmanship. Perform work by persons qualified to produce
15 workmanship of specified quality. Secure products in place with positive anchorage devices
16 designed and sized to withstand stresses, vibrations, and racking.

17
18 28. Fire Protection

19
20 The Contractor and Subcontractors shall be responsible for providing temporary fire
21 protection, and accomplishing work in a fire prevention manner. The Contractor shall be
22 solely responsible for means and methods.

23
24 29. Telephone

25
26 The Contractor shall not make any long distance phone calls on school phones. Use of
27 Owner's telephone is not allowed.

28
29 30. Pre-Construction Site Visit With Owner

30
31 Prior to start of the work a pre-construction meeting consisting of the Engineer, Owner,
32 Contractor, Subcontractors, and others determined appropriate shall be held to establish
33 basic project understanding and clarify project questions.

34
35 Contractor shall make a pre-construction site visit with Owner and note any existing damage
36 in work areas. Contractor shall be responsible for any damage to school property, building,
37 equipment, furnishings, site or school items.

38
39 31. All components, devices, and systems shall be U.L. listed.

40
41 32. Parking Lots

42 Prior to starting work, the Contractor shall coordinate with the Owner any work being
43 accomplished on the parking lots. Coordinate scheduling and access. Contractor shall
44 conduct on-site visit with Owner to inspect parking lots and observe all existing conditions.
45 Contractor and subcontractors shall not damage parking lots. Any damage as a result of
46 Contractor or subcontractors shall be repaired or replaced to the Owner's satisfaction and
47 specifications. Coordinate any trenching across parking lots with Owner/Engineer before
48 starting work. Include all pavement, sidewalk, site, etc. repair/replacement work in base bid.

49
50 **END OF SECTION**

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SECTION 01 02 00

ALLOWANCES

PART 1 - GENERAL

SUMMARY:

All work accomplished by allowances shall be complete and turn-key.

SECTION INCLUDES:

- Include in contractor sum allowances stated in Contract Documents.
- Designate in construction progress schedule delivery dates for products specified under each allowance.
- Designate in Schedule of Values quantities of materials required under each allowance.

ALLOWANCES FOR PRODUCTS:

- Amount of Each Allowance Includes:
 - Cost of Product to Contractor or subcontractor, less any applicable trade discounts.
 - Delivery to site.
 - Labor required under allowance.

- In addition to amount of each allowance, include in contract sum Contractor's cost for:
 - Handling at site, including unloading, uncrating, and storage.
 - Protection from elements and from damage.
 - Labor for installation and finishing.
 - Other expenses required to complete installation.
 - Contractor's and Subcontractor's overhead and profit.

SELECTION OF PRODUCTS UNDER ALLOWANCES:

- Engineer's Duties:
 - Consult with Contractor in consideration of Products and suppliers or installers.
 - Make selection in consultation with Owner. Obtain Owner's written decision, designating:
 - Product, model and finish.
 - Accessories and attachments.
 - Supplier and installer as applicable.
 - Cost to Contractor, delivered to site or installed, as applicable.
 - Manufacturer's Warranties.
 - Transmit Owner's decision to Contractor.
 - Prepare Change Orders.
- Contractor's Duties:
 - Obtain proposals from suppliers and installers when requested by Engineer.
 - Make appropriate recommendations for consideration of Engineer.
 - Notify Engineer promptly of:
 - Any reasonable objections Contractor may have against any supplier, or party under consideration for installation.
 - Any effect on Construction Schedule anticipated by selections under consideration.

CONTRACTOR RESPONSIBILITY FOR PURCHASE, DELIVERY AND INSTALLATION:

- On notification of selection, execute purchase agreement with designated supplier.
- Arrange for and process Shop Drawings, Product Data and Samples, as required.
- Make arrangements for delivery.
- Upon delivery, promptly inspect products for damage or defects.
- Submit claims for transportation damage.
- Install and finish products in compliance with requirements of referenced specification sections.

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1 ADJUSTMENT OF COSTS:

2 Should net cost be less than specified amount of allowance, contract sum will be adjusted accordingly
3 by Change Order.

4 Amount of Change Order will recognize any changes in handling costs at site, labor, installation costs
5 at site, labor, installation costs, overhead, profit and other expenses caused by selection under
6 allowance.

7 For products specified under unit costs allowance, unit cost shall apply to quantity listed in Schedule of
8 Values.

9 For products specified under unit allowance, unit cost allowance shall apply to quantities actually used
10 with nominal amount for waste, as determined by receipts, invoices or field measurements.

11 Submit any claims for anticipated additional costs at site, or other expenses caused by selection under
12 allowance, prior to execution of work.

13
14 Submit documentation for actual additional costs at site, or other expenses caused by selection under
15 allowance within 60 days after completion of execution or Work.

16
17 Failure to submit claims within designated time will constitute waiver of claims for additional costs.

18
19 At contractor closeout, reflect approved changes in contract amounts in final statement of accounting.
20

21 CONSTRUCTION CONTINGENCY:

22 Following shall apply to construction contingency allowance:

23 It shall be used only to cover cost of hidden, concealed or otherwise unforeseen conditions that develop
24 during project.

25 Work which is clearly changed in scope shall be authorized and paid for only by means of change order
26 executed in accordance with established procedures.

27 Bidder shall include in his base bid on project his profit and overhead to cover amount of contingency;
28 as each contingency authorization is processed, it will not include any profit or overhead for Contractor.
29 Contractor shall proceed with accomplishing work only after receiving properly executed contingency
30 authorization executed by Engineer.

31 Contractor shall not bill Owner for any work authorized by this procedure until work has been
32 accomplished.

33 Any part of contingency allowance which is not used during construction of project shall be returned to
34 Owner.

35 At completion of project, Engineer will reconcile all work accomplished through properly executed
36 contingency allowance authorizations, and provide for refund of any unused portion of contingency to
37 Owner through properly executed change order.
38

39
40 PART 2 - PRODUCTS

41 Not used.
42
43

44
45 PART 3 - EXECUTION

46
47 SCHEDULE OF ALLOWANCES:

48 Section 01 02 00 - Construction Allowance:

49 See Bid Form for Allowance.
50
51

52 END OF SECTION

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GENERAL REQUIREMENTS

DIVISION 01

01 91 00 Building Systems Commissioning

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SECTION 01 91 00

BUILDING SYSTEMS COMMISSIONING

PART 1 GENERAL

1.1 DESCRIPTION

- A. Commissioning this project shall include MEP systems installation and operations. The commissioning process shall generally follow the ASHRAE Guideline-0 and ASHRAE Standard 90.1. Commissioning for this project shall be as necessary for full compliance with 2015 IECC commissioning requirements.
- B. Commissioning Agent (CA): The owner will engage the CA under separate contract.
- C. Mechanical and plumbing commissioning shall be done by the registered design professional or approved agency.
- D. For electrical commissioning the registered design professional shall provide evidence that the system is operating in accordance with the construction documents.
- E. Commissioning: Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner’s operational requirements. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
 - 1. Observe and document equipment and systems installations and operations.
 - 2. Observe and document proper performance of equipment and systems per the construction documents.
 - 3. Review systems manual and closeout documentation.
- F. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product, equipment or system.
- G. Abbreviations: The following are common abbreviations used in the specifications and in the Commissioning Plan.

A/E	Architect & Design Engineers	FT	Functional Performance Test
CA/CxA	Commissioning Agent	GC	General Contractor
CC	Construction Manager	MC	Mechanical Contractor
Cx	Commissioning	PC	Project Checklist
CxP	Commissioning Plan	Subs	Sub Contractors
EC	Electrical Contractor	MC	Mechanical Contractor
PLC	Plumbing Contractor	TAB	Test And Balance Contractor
FC	Fire Alarm Contractor	SC	Security Contractor
CTC	Controls Contractor	TC	Technology Contractor

- H. Divisional specifications sections related to commissioning activities are as follows:
 - 1. Division 01 - General Requirements
 - 2. Division 22 - Plumbing
 - 3. Division 23 - HVAC&R
 - 4. Division 26 - Electrical

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1 1.2 REFERENCES
2

- 3 A. On projects where the engineer is the prime consultant and no architect is involved, any
4 references to the architect or to architectural drawings in the specifications shall be interpreted
5 as referring to the engineer or to the engineering drawings.
6

7 1.3 COORDINATION
8

- 9 A. Commissioning Team. The members of the commissioning team consist of the
10 Commissioning Agent (CA), the owner's Project Manager (PM), the designated representative
11 of the owner's Construction Management firm (CM), the General Contractor (GC or
12 Contractor), the architect and design engineers (particularly the mechanical engineer), the
13 Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the
14 Controls Contractor (CC), any other installing subcontractors or suppliers of equipment. If
15 known, the Owner's building or plant operator/engineer is also a member of the commissioning
16 team.
17

- 18 B. Management. The CA will report directly to the Owner for commissioning related functions and
19 copy the Architect and Contractor as required. The CA directs and coordinates the
20 commissioning activities and reports with the CM and PM. All team members work together to
21 fulfill their contracted responsibilities and meet the objectives of the Contract Documents.
22

- 23 C. Scheduling. The CA will work with the CM and GC according to established protocols to
24 schedule the commissioning activities. The CM will notify the CA as to the readiness of
25 systems and equipment for functional testing. The CA will provide sufficient notice to the CM
26 and GC for scheduling commissioning activities for such equipment and systems upon
27 notification from the CM that said systems will be ready for testing and or commissioning. The
28 GC will integrate all commissioning activities into the master project schedule and will provide
29 a copy of the schedule, including all updates, to the CA for his use for commissioning this
30 project. All parties will address scheduling problems and make necessary notifications in a
31 timely manner in order to expedite the commissioning process. It is understood that the
32 progress for commissioning of systems will be dependent upon the progress of the following:

- 33 1. Response Times. Timelines for delivering information requested, required or providing
34 responses to the CA is essential to providing the construction product to the owner on
35 time as well as facilitating the commissioning process. The contractor shall adhere to the
36 following to meet this objective:
37 2. Written response to Issue Log, Punchlist, Site Observation report or request for
38 information, clarification or other documentation necessary to facilitate and carryout the
39 commissioning process: 07 Calendar days from date request was received by contractor
40 in writing.
41 3. Discrepancies identified in record drawings during the construction phase: 15 calendar
42 days.
43

44 1.4 COMMISSIONING PROCESS
45

- 46 A. Commissioning Plan. The Commissioning Plan provides guidance in the execution of the
47 commissioning process. The CA will update the plan which is then considered the "final" plan,
48 though it will continue to evolve and expand and be updated on a regular basis for content by
49 the CA as the project progresses. The Specifications will take precedence over the
50 Commissioning Plan.
51

- 52 B. Commissioning Process. The following narrative provides a brief overview of the typical
53 commissioning tasks during construction and the general order in which they occur.
54

- 55 C. Equipment documentation is submitted to the CA during normal submittals and concurrent
56 with the design team submittal submission, including detailed start-up procedures.

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- 1 D. In general, the check-out and performance verification proceeds from simple to complex; from
2 component level to equipment to systems and intersystem levels with CHECKLISTS being
3 completed before functional testing.
4
5 E. The Subs, under their own direction, execute and document the CHECKLISTS and perform
6 start-up and initial check-out.
7
8 F. The checklist procedures are executed by the contractor responsible for their respective
9 systems and under their respective scope of work. An example of a coordinated procedure
10 would be an AHU that requires Electrical, FA Duct Smoke Detector, DDC Controls and a VFD
11 for operation. This would require a signature from the Mechanical, Electrical, Fire Alarm,
12 Controls contractor and TAB sub.
13
14 G. Functional Testing of the MEP SYSTEMS shall be scheduled by the CA and GC and shall be
15 conducted by the appropriate sub-contractor. The CA will direct the testing and sub-contractor
16 will carry out the test.
17
18 H. Items of non-compliance in material, installation or setup are corrected and the system is to
19 be retested at the contractor's expense.
20
21 I. The CA reviews the O&M documentation for completeness.
22
23 J. Commissioning is completed before Substantial Completion.
24
25 K. Deferred or seasonal testing is to be conducted as specified and as required.
26

27 1.5 RESPONSIBILITIES

- 28
29 A. Commissioning Team: The responsibilities of various parties in the commissioning process
30 are provided in this section and are typically referenced as follows: Division 01 - General
31 Requirements, Division 22 - Plumbing, Division 23 - HVAC & R, 26 - Electrical. It is noted that
32 the services for the Owner's Project Manager, Construction Manager, Architect, MEP, Special
33 systems design consultants and Commissioning Agent are not provided for in this contract.
34 That is, the Contractor is not responsible for providing their services except where stated in
35 other divisional specs sections. Their responsibilities are listed here to clarify the
36 commissioning process.
37 1. The commissioning team, at a minimum, shall consist of the following:
38 a. Owner
39 b. Commissioning Authority
40 c. Architect
41 d. Design Engineer
42 e. Prime Contractor
43 f. Divisional Contractors and Sub contractors
44 g. Vendors or Factory reps where required by the divisional specs
45
46 B. All Parties
47 1. Follow the Commissioning Plan and specifications.
48 2. Attend commissioning scoping meeting and commissioning meetings as necessary.
49 3. Assist the CA in carrying out commissioning process activities.
50

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- 1 C. Architect (A/E)
- 2 1. Construction and Acceptance Phase
- 3 a. Owner Manages the CA contract.
- 4 b. Attend the commissioning scoping meeting and selected commissioning team
- 5 meetings.
- 6 c. Perform normal submittal review, construction observation, as-built drawing
- 7 preparation, O&M manual preparation, etc., as contracted. Provide submittals for
- 8 MEP the CA concurrent with the design consultant's submittal review.
- 9 d. Provide all design narrative documentation and updates as requested by the CA for
- 10 systems to be commissioned.
- 11 e. Coordinate resolution of system and component deficiencies identified during
- 12 commissioning activities.
- 13 f. Copy the CA on all responses to RFI/RFC/Revisions as issued by the design team
- 14 related to systems being commissioned.
- 15 g. Furnish a copy of all construction documents, addenda, change orders, RFI's, ASI's
- 16 and approved submittals and shop drawings related to commissioned equipment to
- 17 the CA.
- 18 h. Review and approve O&M documentation.
- 19 i. Warranty Period
- 20 j. Coordinate resolution of design non-conformance issues, design deficiencies and
- 21 contractor related deficiencies identified during warranty-period commissioning.
- 22
- 23 D. MEP & Special Systems Designers/Engineers (of the A/E)
- 24 1. Construction and Acceptance Phase
- 25 a. Perform normal submittal review, construction observation, as-built drawing
- 26 preparation, etc., as contracted. Conduct site observations as contracted and
- 27 required by the owner and A/E.
- 28 b. Provide an updated design narrative and sequences documentation requested by
- 29 the CA for functional testing of MEP systems. The designers shall assist (along with
- 30 the contractors) in clarifying the operation and control of commissioned MEP
- 31 equipment in areas where the specifications, control drawings or equipment
- 32 documentation is not sufficient for writing detailed testing procedures.
- 33 c. Attend commissioning scoping meetings and other selected commissioning team
- 34 meetings.
- 35 d. Participate in the resolution of system deficiencies identified during commissioning,
- 36 according to the contract documents.
- 37 e. Prepare and submit the final as-built design intent and operating parameters
- 38 documentation. Review and approve the O&M manuals.
- 39 f. Review, comment and approve the functional test procedures for sufficiency prior to
- 40 their use.
- 41 g. Utilizing the sampling method, review and provide comments and recommendations
- 42 for the checklists for major pieces of equipment for sufficiency prior to their use.
- 43 h. Warranty Period
- 44 i. Participate in the resolution of non-compliance, non-conformance and design
- 45 deficiencies identified during commissioning during warranty-period commissioning.
- 46
- 47 E. Commissioning Agent (CA)
- 48 1. Construction and Acceptance Phase
- 49 a. The CA is not responsible for design concepts, design criteria, compliance with
- 50 codes and industry design standards, design or general construction scheduling,
- 51 cost estimating, test and balance or construction management. The CA may assist
- 52 with issue resolution for non-conformance or deficiencies, but ultimately that
- 53 responsibility resides with the general contractor and the A/E. The primary function
- 54 of the CA is to develop and coordinate the execution of a testing plan, observe and
- 55 document and verify using sampling techniques that systems are functioning in
- 56 accordance with the documented OPR and the Construction Documents. The

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- 1 Contractors will provide all of their own tools to install, start, check-out and
2 functionally test equipment and systems.
- 3 b. Coordinates and directs the commissioning activities in a logical, sequential and
4 efficient manner using consistent protocols and forms, centralized documentation,
5 clear and regular communications and consultations with all necessary parties,
6 frequently updated timelines and schedules and technical expertise.
- 7 c. Coordinate the commissioning work and, with the GC and CM, ensure that
8 commissioning activities are being scheduled into the master project schedule.
- 9 d. Revise the Commissioning Plan during the construction phase as necessary.
- 10 e. Request and review information required to perform commissioning tasks, including
11 O&M materials, contractor start-up and check-out procedures as necessary.
- 12 f. Before start-up, gather and review the current control sequences and interlocks and
13 work with contractors and design engineers until sufficient clarity has been obtained,
14 in writing, to be able to write testing procedures as necessary.
- 15 g. Write and distribute systems functional performance Test requirements.
- 16 h. Attend selected planning and job-site meetings to obtain information on construction
17 progress. Review construction meeting minutes for revisions and substitutions
18 relating to the Commissioning process. Assist in resolving discrepancies.
- 19 i. Perform site observations as necessary to observe component and system
20 installations for testing of systems.
- 21 j. Oversee sufficient functional testing of the control system.
- 22 k. With assistance from installing contractors and A/E, write the functional performance
23 test procedures for equipment and systems. This may include energy management
24 control system trending or manual functional testing.
- 25 l. Analyze any functional performance trend logs and monitoring data as required to
26 verify performance.
- 27 m. Coordinate, witness, and approve manual functional performance tests performed
28 by installing contractors. Coordinate retesting with the GC and A/E as necessary or
29 required.
- 30 n. Maintain a master issue and resolution log and a separate testing record. Provide
31 the owner and CM/GC with periodic written progress reports and test results with
32 recommended actions.
- 33 o. Witness performance testing of control systems and document these tests and
34 include this documentation in Commissioning Record in O&M manuals.
- 35 p. Compile and maintain a commissioning record and review building systems manual.
- 36 q. Review and approve the preparation of the O&M manuals.
- 37 r. Provide a final commissioning report.
- 38 s. Warranty Period: Coordinate and supervise required seasonal or deferred testing
39 and deficiency corrections.
- 40
- 41 F. Construction Manager-Owner's Representative (CM) as applicable
- 42 1. Construction and Acceptance Phase
- 43 a. Facilitate the coordination of the commissioning work by the CA, working with the
44 GC, to ensure that commissioning activities are being scheduled into the master
45 project schedule.
- 46 b. Review and be familiar with the commissioning specifications and final
47 Commissioning Plan-Construction Phase.
- 48 c. Attend the commissioning scoping meeting and other commissioning team
49 meetings.
- 50 d. Perform the normal review of Contractor submittals.
- 51 e. Furnish a copy of all construction documents, addenda, change orders and
52 approved submittals and shop drawings related to commissioned equipment to the
53 CA.
- 54 f. Review the functional performance test procedures submitted by the CA, prior to
55 testing.

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- 1 g. When necessary, observe and witness checklists, start-up and functional testing of
- 2 selected equipment.
- 3 h. Review commissioning progress and deficiency reports.
- 4 i. Coordinate the resolution of non-compliance and design deficiencies identified in all
- 5 phases of commissioning.
- 6 j. Sign-off (final approval) on individual commissioning tests as completed and
- 7 passing. Recommend completion of the commissioning process to the Project
- 8 Manager.
- 9 k. Assist the GC in coordinating the training of owner personnel.
- 10 l. Warranty Period: Assist the CA as necessary in the seasonal or deferred testing and
- 11 deficiency corrections required by the contract documents.
- 12

13 G. Owner's Project Manager (PM)

- 14 1. Construction and Acceptance Phase
- 15 2. Assist the CA as necessary to carry out commissioning activities.
- 16 3. Manage the contract of the CA, A/E and the GC.
- 17 4. Arrange for facility operating and maintenance personnel to attend various field
- 18 commissioning activities and field training sessions.
- 19 5. Provide final approval for the completion of the commissioning work.
- 20 6. Warranty Period: Ensure that any seasonal or deferred testing and any deficiency issues
- 21 are addressed or that a plan is in place to address issues pending resolution
- 22

23 H. General Contractor (GC)

- 24 1. Contractor and their subcontractors and vendors shall assign capable, skilled and
- 25 knowledgeable representatives with expertise and authority to act on their behalf and
- 26 schedule them to participate in and to perform commissioning process activities.
- 27 2. Construction and Acceptance Phase
- 28 a. Facilitate the coordination of the commissioning work by the CA and ensure that
- 29 commissioning activities are being addressed in the master construction project
- 30 schedule.
- 31 b. Include the cost of commissioning tasks to be carried out by the contractor and subs,
- 32 for commissioning of the building systems in the contract price. This will not include
- 33 the CA's contract. The CA's contract for commissioning services shall be between
- 34 the owner and CA.
- 35 c. In each purchase order or subcontract written, include requirements for submittal
- 36 data, O&M data, commissioning tasks and training.
- 37 d. Ensure that all Subs execute their commissioning responsibilities according to the
- 38 Contract Documents and schedule.
- 39 e. A representative shall attend a commissioning scoping meeting and other necessary
- 40 meetings scheduled by the CA to facilitate the Cx process.
- 41 f. Coordinate and conduct owner training on building and systems operation for
- 42 equipment provided and installed.
- 43 g. Prepare close out documents including O&M documents, according to the Contract
- 44 Documents, including clarifying and updating the original control sequences of
- 45 operation and As-built drawings.
- 46 h. Warranty Period: Ensure that Subs execute seasonal or deferred functional
- 47 performance testing, to be witnessed by the CA, according to the specifications
- 48 i. Ensure that Subs correct deficiencies and make necessary adjustments to O&M
- 49 manuals and final as-built drawings and warranty documents for applicable issues
- 50 identified in any seasonal and deferred testing.
- 51

52 I. Equipment Suppliers

- 53 1. Construction and Acceptance Phase
- 54 a. Provide all requested submittal data, including detailed start-up procedures, blank
- 55 start up docs and checklists and specific responsibilities of the Owner to keep
- 56 warranties in force.

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- 1 b. Assist in equipment start up, energizing and pre-testing per agreements with Subs.
- 2 c. Include all special tools and instruments (only available from vendor, specific to a
- 3 piece of equipment) required for testing equipment according to these Contract
- 4 Documents in the base bid price to the Contractor, except for stand-alone data
- 5 logging equipment that may be used by the CA. Such tools not required for routine
- 6 maintenance, operation and service and not required to be turned over to the owner
- 7 under other divisional spec sections, shall be returned to the user providing such
- 8 tools. Examples of this intent would be a flow hood used by the TAB contractor would
- 9 be returned and remain the property of the TAB contractor where as a special key
- 10 for unlocking the chiller control cabinet would be turned over to the owner.
- 11 d. Provide information requested by CA regarding equipment sequence of operation
- 12 and testing procedures.
- 13 e. Review system start up and test procedures for equipment installed by factory
- 14 representatives.
- 15
- 16 J. Mechanical Contractor
- 17 1. Provide start-up for all HVAC equipment.
- 18 2. Assist and cooperate with the TAB contractor and CA by:
- 19 a. Putting all HVAC equipment and systems into operation and continuing the
- 20 operation during each working day of TAB and commissioning, as required.
- 21 b. Including cost of sheaves and belts that may be required by TAB.
- 22 Providing test holes in ducts and plenums where directed by TAB to allow air
- 23 measurements and air balancing. Provide an approved rubber or steel plug to seal
- 24 traverse holes.
- 25 c. Providing temperature and pressure taps according to the Construction Documents
- 26 for TAB and commissioning testing.
- 27 3. Install a P/T plug at each water sensor which is an input point to the control system and
- 28 both inlet and discharge side of ALL pumps for TAB.
- 29 4. List and clearly identify on the as-built drawings the locations of all air-flow stations.
- 30 5. Notify the GC or CA depending on protocol, when pipe and duct system testing, flushing,
- 31 cleaning, start-up of each piece of equipment and TAB will occur. Be responsible to notify
- 32 the GC or CA, ahead of time, when commissioning activities not yet performed or not yet
- 33 scheduled could delay construction. Be proactive in seeing that commissioning
- 34 processes are executed and that the CA has the scheduling information needed to
- 35 efficiently execute the commissioning process.
- 36
- 37 K. Controls Contractor
- 38 1. Sequences of Operation Submittals. The Controls Contractor's submittals of control
- 39 drawings shall include complete detailed sequences of operation for each piece of
- 40 equipment, regardless of the completeness and clarity of the sequences in the
- 41 specifications or drawings. The engineer shall be provided written documentation for any
- 42 revisions to the HVAC&R design documents including engineered approved control
- 43 sequences. Upon review of the DDC control submittals, the engineer shall provide his
- 44 approval or rejection in writing to the controls contractor. The Controls Contractor's
- 45 submittals of control drawings shall include:
- 46 a. An overview narrative of the system (1 or 2 paragraphs) generally describing its
- 47 purpose, components and function.
- 48 b. All interactions and interlocks with other systems.
- 49 c. Detailed delineation of control between any packaged controls and the building
- 50 automation system, listing what points the BAS monitors only and what BAS points
- 51 are control points and are adjustable.
- 52 d. Written sequences of control for packaged controlled equipment. (Equipment
- 53 manufacturers' stock sequences may be included but will generally require
- 54 additional narrative).
- 55 e. Start-up sequences.
- 56 f. Warm-up mode and Optimum Start sequences.

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- 1 g. Normal operating mode sequences.
- 2 h. Unoccupied mode sequences.
- 3 i. Shutdown sequences.
- 4 j. Capacity control sequences and equipment staging.
- 5 k. Temperature and pressure control: setbacks, setups, resets, etc.
- 6 l. Detailed sequences for all control strategies, e.g., economizer control, optimum
- 7 start/stop, staging, optimization, demand limiting, etc.
- 8 m. Effects of power or equipment failure with all standby component including HVAC
- 9 and Emergency powered systems with VFD's and responses (Restart, Alarm, etc.).
- 10 n. Sequences for all alarms and emergency shut downs.
- 11 o. Seasonal operational differences and recommendations.
- 12 p. Initial and recommended values for all adjustable settings, setpoints parameters that
- 13 are typically set or adjusted by operating staff; and any other control settings or fixed
- 14 values, delays, etc. that will be useful during testing and operating the equipment.
- 15 q. Schedules, if known and provided by owner.
- 16 r. All sequences shall be written in small statements, each with a number for reference.
- 17 For a given system, numbers will not repeat for different sequence sections, unless
- 18 the sections are numbered.
- 19 2. Control Drawings Submittal
- 20 a. The control drawings shall have a key and legend to all abbreviations and symbols.
- 21 b. The control drawings shall contain graphic schematic depictions of the systems and
- 22 each component.
- 23 c. The schematics will include the system and component layout of any equipment that
- 24 the control system monitors, enables or controls, even if the equipment is primarily
- 25 controlled by packaged or integral controls.
- 26 d. Provide a full points list with at least the following included for each point:
- 27 (1) Controlled system Point abbreviation
- 28 (2) Point description
- 29 (3) Display unit
- 30 (4) Control point or setpoint (Yes / No)
- 31 (5) Monitoring point (Yes / No)
- 32 (6) Intermediate point (Yes / No)
- 33 (7) Calculated point (Yes / No)
- 34 • Key:
- 35 • Point Description: DB temp, airflow, etc.
- 36 • Control or Setpoint: Point that controls equipment and can have its
- 37 setpoints changed (OSA, SAT, etc.)
- 38 • Intermediate Point: A Point whose value is used to make a calculation
- 39 which then controls equipment (space temperatures that are averaged
- 40 to a virtual point to control reset).
- 41 • Monitoring Point: A Point that does not control or contribute to the
- 42 control of equipment; but is used for the operations, maintenance or
- 43 performance verification.
- 44 • Calculated Point: "Virtual" point generated from calculations of other
- 45 point values. The Controls Contractor shall keep the CA informed of all
- 46 changes to this list during programming and setup in all phases of the
- 47 project.
- 48 3. An updated as-built version of the control drawings and sequences of operation shall be
- 49 included in the final controls O&M manual submittal.
- 50 4. Assist, coordinate and cooperate with the TAB contractor in the following manner:
- 51 a. Meet with the TAB contractor prior to beginning TAB work and review the TAB plan
- 52 to determine the capabilities of the control system toward completing TAB. Provide
- 53 the TAB any needed unique instruments for setting terminal unit boxes and instruct
- 54 TAB in their use (handheld control system interface for use around the building
- 55 during TAB, etc.).

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- 1 b. For a given area, have all required checklists, calibrations, start-up and selected
- 2 Pre-commissioning documentation of the system available during TAB activities.
- 3 c. Provide a qualified technician to operate the controls, to assist the TAB contractor
- 4 in performing TAB work, during scheduled TAB activities. Remote operation of
- 5 control system, during scheduled TAB and Functional Testing, will not be
- 6 acceptable. The Controls contractor may provide training to the TAB technician for
- 7 inputting data into the control software and logic. However, the controls contractor
- 8 shall be ultimately responsible for entering and saving the data, provided by the TAB
- 9 contractor, into the control system.
- 10 5. Assist and cooperate with the CA in the following manner:
- 11 a. Execute the functional testing of the controls system as specified for the controls
- 12 contractor in Controls Specification Section.
- 13 b. Assist in the functional testing of all equipment specified.
- 14 c. Execute all control system trend logs specified.
- 15 6. Provide a signed and dated certification to the CA and GC upon completion of the
- 16 check-out of each controlled device, equipment and system prior to TAB and functional
- 17 testing. This shall be for each piece of equipment or system, Confirmation that all system
- 18 programming, installation of control components, debugging, pre-testing, checkout is
- 19 complete and the control system is made fully operational as to all respects of the
- 20 Contract Documents. This shall be completed prior to any TAB work or functional testing
- 21 of the building systems under DDC control.
- 22 7. Beyond the control points necessary to execute all documented control sequences
- 23 provide monitoring, control and virtual points.
- 24 8. List and clearly identify on the as-built duct and piping drawings the locations of ALL:
- 25 static and differential pressure sensors (air, water and building pressure), hydronic
- 26 control valves/actuators, electrical control relays for lighting and control boards.
- 27 9. The Controls Contractor shall be responsible for Pre-commissioning of all control system
- 28 and components provided and installed by the controls contractor. See other sections of
- 29 this specification and divisional specifications for training requirements. During TAB and
- 30 functional testing, the controls contractor shall produce, at the request of the engineer or
- 31 commissioning authority, graphic screen shots of the building systems operation as
- 32 indicated on the building controls graphics.
- 33
- 34 L. Test and Balance Contractor (TAB)
- 35 1. Prior to starting TAB, submit to the CA and GC, the lead TAB technicians contact
- 36 information.
- 37 2. Submit the outline of the TAB plan, to the CA, GC and Controls Contractor prior to starting
- 38 the TAB. The TAB contractor will be provided with a set of final approved mechanical and
- 39 HVAC&R control submittals by the GC, 60 calendar days prior to beginning TAB
- 40 activities.
- 41 4. The submitted TAB plan may include:
- 42 a. Certification that the TAB contractor has reviewed the construction documents and
- 43 the systems with the design engineers and contractors to sufficiently understand the
- 44 design intent for each system.
- 45 b. An explanation of the intended use of the building control system. The controls
- 46 contractor will comment on feasibility of the plan.
- 47 c. All field check-out sheets and logs to be used that list each piece of equipment to be
- 48 tested, adjusted and balanced with the data cells to be gathered for each.
- 49 d. Discussion of what notations and markings will be made on the duct and piping
- 50 drawings during the process.
- 51 e. Final test report forms to be used.
- 52 f. Detailed step-by-step procedures for TAB work for each system and issue.

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- 1 g. Terminal flow calibration (for each terminal type), diffuser proportioning, branch and
2 submain proportioning, total flow calculations, rechecking, diversity issues, expected
3 problems and solutions, etc. Criteria for using air flow straighteners or relocating flow
4 stations and sensors will be discussed. Provide the analogous explanations for the
5 water side.
- 6 h. List of all air flow, water flow, sound level, system capacity and efficiency
7 measurements to be performed and a description of specific test procedures,
8 parameters, formulas to be used.
- 9 i. Details of how total flow will be determined (Air: sum of terminal flows via BAS
10 calibrated readings or via hood readings of all terminals, supply (SA) and return air
11 (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow
12 station, ultrasonic, etc.).
- 13 j. The identification and types of measurement instruments to be used and their most
14 recent calibration date.
- 15 k. Specific procedures that will ensure that both air and water side are operating at the
16 lowest possible pressures and provide methods to verify this.
- 17 l. Confirmation that TAB understands the outside air ventilation criteria under all
18 operational conditions.
- 19 m. Details of whether and how minimum outside air cfm will be verified and set and for
20 what level (total building, zone, etc.).
- 21 n. Details of how building static and exhaust fan / relief damper capacity will be
22 checked.
- 23 o. Proposed selection points for sound measurements and sound measurement
24 methods.
- 25 p. Details of methods for making any specified coil or other system plant capacity
26 measurements.
- 27 q. Details of any TAB work to be done in phases (by floor, etc.), or of areas to be built
28 out later.
- 29 r. Details regarding specified deferred or seasonal TAB work.
- 30 s. Details of any specified false loading of systems to complete TAB work.
- 31 t. Details of all exhaust fan balancing and capacity verifications, including any required
32 room pressure differentials.
- 33 u. Details of any required interstitial cavity differential pressure measurements and
34 calculations.
- 35 v. Plan for hand-written field technician logs of discrepancies, deficient or uncompleted
36 work by others, contract interpretation requests and lists of completed tests (scope
37 and frequency).
- 38 w. Plan for formal progress reports (scope and frequency).
- 39 x. Plan for formal deficiency reports (scope, frequency and distribution).
- 40 5. A running log of events and issues shall be kept by the TAB field technicians. Submit
41 hand-written reports of discrepancies, deficient or uncompleted work by others, contract
42 interpretation requests and lists of completed TAB work. All issues found during daily
43 TAB activities shall be provided to the GC on site and prior to leaving the job site for the
44 day.
- 45 6. Communicate in writing to the controls contractor all setpoint and parameter changes
46 made or problems and discrepancies identified during TAB which affect the control
47 system setup and operation.
- 48 7. Provide a draft TAB report within five calendar days of starting Functional Testing of the
49 HVAC & R systems. Field notes that are legible shall be allowed to be submitted in place
50 of a full draft TAB report.
- 51 8. Provide the CA with requested system data findings, gathered or collected during TAB
52 work, but not shown on the TAB reports.
- 53 9. Provide a final and complete TAB report for the CA and A/E within 15 calendar days from
54 end of TAB work and as requested by the CA. Punch list items or issues discovered
55 during scheduled TAB activities, reported to the GC for correction by the GC's subs or
56 vendors, which cause delay in the TAB contractors ability to complete his work on time

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- 1 per the project schedule, will have the additional time required to complete the TAB work,
2 charged to the GC who may choose to back charge his/her subs. Charges shall be on a
3 Time and Material basis and shall be documented with a line item breakdown for
4 Manpower, time, systems TAB' d and date of work. Such documentation shall be made
5 available for review by the GC and A/E, prior to any approval by the GC.
6 10. Assist the CA as needed and required to carry out all HVAC & R functional testing.
7 Conduct functional performance tests and checks on the original TAB as specified for
8 TAB in Division 23 and controls specification section. Make follow up visits to the site as
9 necessary and required to correct any work deficiencies or variances to contract
10 documents made by the TAB technician.
11
12 M. Electrical Contractor
13 1. Include the cost of commissioning by the electrical sub in the contract price.
14 2. Include requirements for submittal data, O&M data and owner training.
15 3. Attend a commissioning scoping meeting and other necessary meetings scheduled by
16 the CA to facilitate the Cx process.
17 4. Contractor shall provide normal cut sheets and shop drawing submittals to the CA of
18 electrical systems to be commissioned.
19 5. Provide requested electrical systems documentation to the CA when requested by the
20 CA, for development of functional testing procedures.
21 a. Typically, this will include detailed manufacturer installation and start-up, operating,
22 b. Troubleshooting and maintenance procedures, full details of any owner-contracted
23 tests, fan and pump curves, full factory testing reports, if any, and full warranty
24 information, including all responsibilities of the Owner to keep the warranty in force
25 clearly identified. In addition, the installation and check-out materials that are
26 actually shipped inside the equipment and the actual field check-out sheet forms to
27 be used by the factory or field technicians shall be submitted to the Commissioning
28 Agent.
29 c. The Commissioning Agent may request further documentation necessary for the
30 commissioning process.
31 d. This data request may be made prior to or post normal submittals.
32 6. Provide a copy of the electrical systems O&M manuals submittals of commissioned
33 equipment, through normal channels, to the CA.
34 7. Contractors shall assist (along with the design engineers) in clarifying the operation and
35 control of electrical commissioned equipment in areas where the specifications, control
36 drawings or equipment documentation is not sufficient for writing detailed electrical
37 testing procedures.
38 8. Provide assistance to the CA in for developing and conducting all CA directed electrical
39 testing. Subs shall review all test procedures to ensure feasibility, safety and equipment
40 protection and provide necessary written alarm limits to be used during the tests.
41 9. In a clear and legible format, document all completed installation, start-up and system
42 operational check-out procedures, providing a copy to the A/E and CA.
43 10. Address current A/E punch list and Cx Issues Log items before final payment is released.
44 11. Provide skilled technicians to execute energizing and starting of electrical equipment and
45 to execute all required electrical tests. Ensure that they are available and present during
46 the agreed upon schedules and for sufficient duration to complete the necessary tests,
47 adjustments and issue resolution.
48 12. Perform functional performance testing under the direction of the CA or A/E for specified
49 electrical equipment tests. Assist the CA in interpreting any monitoring data, as
50 necessary.
51 13. Correct deficiencies (differences between specified and observed performance) as
52 interpreted by the CA, GC and A/E and retest the equipment.
53 14. Prepare O&M manuals and red-line as-built drawings according to the Contract
54 Documents, including updating the electrical as-built conditions.
55 15. Provide training of the Owner's operating personnel as specified.

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- 1 16. Coordinate with equipment manufacturers to determine specific requirements to maintain
- 2 the validity of the warranty.
- 3 17. Warranty Period: Execute and assist the CA in carrying out deferred functional
- 4 performance testing according to the specifications.
- 5 18. Correct deficiencies and make necessary adjustments to electrical systems O&M
- 6 manuals and electrical as-built drawings for applicable issues identified in any seasonal
- 7 or deferred testing.
- 8
- 9 N. Plumbing Contractor
- 10 1. Provide installation and operation for all plumbing equipment.
- 11 2. Assist and cooperate with the CA by putting all plumbing equipment, fixtures, domestic
- 12 water systems, water heaters and recirc pumps, etc., into operation as requested by the
- 13 CA for testing and confirming the operation of such equipment and components installed
- 14 under the plumbing scope of services.
- 15 3. List and clearly identify on the as-built drawings the locations of all plumbing valves
- 16 installed above ceiling, in building walls and underground.
- 17 4. Be responsible to notify the GC and CA, ahead of time, when commissioning
- 18 5. Activities related to plumbing systems not scheduled could delay construction.
- 19 6. Include the cost of commissioning by the plumbing sub in the contract price.
- 20 7. Include requirements for plumbing submittal data, O&M data and participation in owner
- 21 training for plumbing systems.
- 22 8. Attend a commissioning scoping meeting and other necessary meetings scheduled by the
- 23 CA to facilitate the Cx process.
- 24 9. Contractor shall provide normal cut sheets and shop drawing submittals to the CA for
- 25 plumbing systems to be commissioned. Submissions shall follow proper protocol for
- 26 distribution of materials. Typically, from Vendor to Sub to GC to Architect, or CM to CA.
- 27 10. Provide requested plumbing systems documentation to the CA when requested by the
- 28 CA for development of plumbing checklists and testing procedures.
- 29 11. Typically, this will include detailed manufacturer installation and start-up, operating,
- 30 troubleshooting and maintenance procedures, full details of any owner-contracted tests
- 31 and pump curves, factory test reports, if any, and full warranty information, including all
- 32 responsibilities of the Owner to keep the warranty in force clearly identified. In addition,
- 33 the installation and check-out materials that are actually shipped inside the plumbing
- 34 equipment and the actual field check-out sheet forms to be used by the factory or field
- 35 technicians shall be submitted to the Commissioning Agent.
- 36 12. The Commissioning Agent may request further documentation necessary for the
- 37 commissioning process.
- 38 13. This data request may be made prior to or post normal submittals.
- 39 14. Provide a copy of the plumbing systems O&M manuals submittals of commissioned
- 40 equipment, through normal channels, to the CA.
- 41 15. Contractors shall assist (along with the design engineers) in clarifying the operation and
- 42 control of plumbing systems commissioned, in areas where the specifications, control
- 43 drawings or equipment documentation is not sufficient for writing detailed testing
- 44 procedures.
- 45 16. Provide assistance to the CA for developing and conducting all CA directed plumbing
- 46 system and equipment testing. Subs shall review all test procedures to ensure feasibility,
- 47 safety and equipment protection and provide necessary written alarm limits to be used
- 48 during the tests.
- 49 17. Develop a full installation check-out plan using manufacturer's installation, start-up
- 50 procedures and the checklists from the CA and other requested equipment documentation
- 51 to CA and A/E for review.

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- 1 18. During the start-up and initial check-out process for Plumbing systems, equipment
2 requiring electrical power, will require coordination with the electrical sub to execute and
3 document the electrical-related portions of the plumbing checklists and likewise for HVAC
4 and Electrical devices where plumbing systems and equipment are installed as part of the
5 complete HVAC or electrical system, the plumbing sub must coordinate with those
6 disciplines for sign off of the checklist documents.
- 7 19. In a clear and legible format, document all completed installation, start-up and system
8 operational check-out procedures, providing a copy to the A/E and CA through the GC.
- 9 20. Provide skilled technicians to execute energizing and starting of electrical equipment and
10 to execute all required electrical tests. Ensure that they are available and present during
11 the agreed upon schedules and for sufficient duration to complete the necessary tests,
12 adjustments and issue resolution.
- 13 21. Perform functional performance testing under the direction of the CA or A/E for specified
14 plumbing equipment tests.
- 15 22. Correct deficiencies (differences between specified and observed performance) as
16 interpreted by the CA, GC and A/E and retest the equipment.
- 17 23. Address current A/E punch list and Cx Issues Log items before final payment is released.
- 18 24. Prepare O&M manuals and red-line as-built drawings according to the Contract
19 Documents, including updating the plumbing as-built conditions.
- 20 25. Provide training of the Owner's operating personnel for operation and maintenance of
21 plumbing systems.
- 22 26. Coordinate with equipment manufacturers to determine specific requirements to maintain
23 the validity of the warranty.
- 24 27. Warranty Period: Execute and assist the CA in carrying out deferred testing according to
25 the specifications.
- 26 28. Correct deficiencies and make necessary adjustments to plumbing systems O&M
27 manuals and as-built drawings for applicable issues identified in any seasonal or deferred
28 testing.

29
30 1.6 DEFINITIONS

- 31
- 32 A. Acceptance Phase - Phase of construction after start-up and initial check-out when functional
33 performance tests, O&M documentation review and training occurs.
- 34
- 35 B. Approval - Acceptance that a piece of equipment or system has been properly installed and is
36 functioning in the tested modes according to the Contract Documents.
- 37
- 38 C. Architect / Engineer (A/E) - The prime consultant (architect) and sub-consultants who
39 comprise the design team; generally the HVAC mechanical designer/engineer and the
40 electrical designer/engineer.
- 41
- 42 D. Basis of Design (BOD) - The basis of design is the documentation of the primary thought
43 processes and assumptions behind design decisions that were made to meet the design
44 intent. The basis of design describes the systems, components, conditions and methods
45 chosen to meet the intent. Some reiterating of the design intent may be included.
- 46

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- 1 E. Checklist (PC) - A list of items to inspect and elementary component tests to conduct to verify
2 proper installation of equipment. Checklists are primarily static inspections and procedures to
3 prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels
4 affixed, gages in place, sensors calibrated, etc.). However, some Checklists items entail
5 simple testing of the function of a component, a piece of equipment or system (such as
6 measuring the voltage imbalance on a three phase pump motor of a chiller system). The word
7 pre-functional refers to before functional performance testing. Checklists augment and are
8 combined with the manufacturer's start-up checklist. Even without a commissioning process,
9 contractors typically perform some checklists items. However, few contractors document in
10 writing the execution of these checklist items. Therefore, for most equipment, the contractors
11 execute the checklists on their own.
12
- 13 F. Commissioning Agent (CA) - An independent agent, not otherwise associated with the A/E
14 team members or the Contractor, though CA may be hired as a subcontractor to them. The
15 CA directs and coordinates the day-to-day commissioning activities. The CA does not take an
16 oversight role like the CM. The CA is part of the Construction Manager (CM) team or shall
17 report directly to the CM.
18
- 19 G. Commissioning Plan - An overall plan, developed before or after bidding that provides the
20 structure, schedule and coordination planning for the commissioning process.
21
- 22 H. Contract Documents - The documents binding on parties involved in the construction of this
23 project (drawings, specifications, change orders, amendments, contracts, Cx Plan, etc.).
24
- 25 I. Contractor - The general contractor or authorized representative.
26
- 27 J. Control system - The central building energy management control system.
28
- 29 K. Construction Manager (CM) - The Owner's representative in the day-to-day activities of
30 construction. In general, the construction management services contractor (CM) is hired by
31 the owner to assist in the overall management of the project including supervising and on-site
32 managing authority over a project's construction. The General Contractor reports to the CM.
33 The CM is the owner's on-site representative.
34
- 35 L. Data logging - Monitoring flows, currents, status, pressures, etc. of equipment using DDC
36 control system.
37
- 38 M. Deferred Functional Tests - FTs that are performed later, after substantial completion, due to
39 partial occupancy, equipment, seasonal requirements, design or other site conditions that
40 disallow the test from being performed.
41
- 42 N. Deficiency - A condition in the installation or function of a component, piece of equipment or
43 system that is not in compliance with the Contract Documents (it does not perform properly or
44 is not complying with the design intent).
45
- 46 O. Design Intent - A dynamic document that provides the explanation of the ideas, concepts and
47 criteria that are considered to be very important to the owner. It is initially the outcome of the
48 programming and conceptual design phases.
49
- 50 P. Design Narrative or Design Documentation - Sections of the Design Intent or BOD.
51
- 52 Q. Factory Testing - Testing of equipment on-site or at the factory by factory personnel with an
53 Owner's representative present.
54

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- 1 R. Functional Performance Test (FT) - Test of the dynamic function and operation of equipment
2 and systems using manual (direct observation) or monitoring methods. Functional testing is
3 the dynamic testing of systems (rather than just components) under full operation (e.g., the
4 chiller pump is tested interactively with the chiller functions to see if the pump ramps up and
5 down to maintain the differential pressure setpoint). Systems are tested under various modes,
6 such as during low cooling or heating loads, high loads, component failures, unoccupied,
7 varying outside air temperatures, fire alarm, power failure, etc. The systems are run through
8 all the control system's sequences of operation and components are verified to be responding
9 as the sequences state. Traditional air or water test and balancing (TAB) is not functional
10 testing, in the commissioning sense of the word. TAB's primary work is setting up the system
11 flows and pressures as specified, while functional testing is verifying that which has already
12 been set-up. The commissioning agent develops the functional test procedures in a sequential
13 written form, coordinates, oversees and documents the actual testing, which is usually
14 performed by the installing contractor or vendor. FTs are performed after CHECKLISTS and
15 start-up is complete.
16
- 17 S. General Contractor (GC) - The prime contractor for this project generally refers to all the GC's
18 subcontractors as well. Also is referred to as the Contractor in some contexts.
19
- 20 T. Indirect Indicators - Indicators of a response or condition, such as a reading from a control
21 system screen reporting a damper to be 100% closed.
22
- 23 U. Manual Test - Using hand-held instruments, immediate control system readouts or direct
24 observation to verify performance (contrasted to analyzing monitored data taken over time to
25 make the "observation").
26
- 27 V. Monitoring - The recording of parameters (flow, current, status, pressure, etc.) of equipment
28 operation using data loggers or the trending capabilities of control systems.
29
- 30 W. Non-Compliance - See the definition of Deficiency.
31
- 32 X. Non-Conformance - See the definition of Deficiency.
33
- 34 Y. Over-written Value - Writing over a sensor value in the control system to see the response of
35 a system (e.g., changing the outside air temperature value from 50°F to 75°F to verify
36 economizer operation). See also "Simulated Signal."
37
- 38 Z. Owner-Contracted Tests - Tests paid for by the Owner outside the GC's contract and for which
39 the CA does not oversee. These tests will not be repeated during functional tests if properly
40 documented.
41
- 42 AA. Phased Commissioning - Commissioning that is completed in phases (by floors, for example)
43 due to the size of the structure or other scheduling issues, in order minimize the total
44 construction time.
45
- 46 BB. Project Manager (PM) - The contracting and managing authority for the owner over the design
47 and/or construction of the project.
48
- 49 CC. Sampling - Functionally testing only a fraction of the total number of identical or near identical
50 pieces of equipment.
51
- 52 DD. Seasonal Performance Tests - FT that are deferred until the system(s) will experience
53 conditions closer to their design conditions.
54

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- 1 EE. Simulated Condition - Condition that is created for the purpose of testing the response of a
- 2 system (e.g., applying a heated air to a space sensor using a hair dryer to see the response
- 3 in the HVAC system).
- 4
- 5 FF. Simulated Signal - Disconnecting a sensor and using a signal generator to send an amperage,
- 6 resistance or pressure to the transducer and DDC system to simulate a sensor value.
- 7
- 8 GG. Specifications - The construction specifications of the Contract Documents.
- 9
- 10 HH. Start-up - The initial starting or activating of dynamic equipment, including executing
- 11 Checklists.
- 12
- 13 II. Subs - The subcontractors to the GC who provide and install building components and
- 14 systems.
- 15
- 16 JJ. Systems/Subsystems/Equipment & Components - Where these terms are used together or
- 17 separately, they shall mean "As-Built" systems, subsystems, equipment and component.
- 18
- 19 KK. Test Procedures - The step-by-step process which must be executed to fulfill the test
- 20 requirements. The test procedures are developed by the CA.
- 21
- 22 LL. Test Requirements - Requirements specifying what modes and functions, etc. shall be tested.
- 23 The test requirements are not the detailed test procedures. The test requirements are
- 24 specified in the Contract Documents.
- 25
- 26 MM. Trending - Monitoring using the building control system.
- 27
- 28 NN. Vendor - Supplier of equipment.
- 29
- 30 OO. Warranty Period - The Warranty period for the entire project, including equipment components.
- 31 Warranty begins at Substantial Completion and extends for at least one year, unless
- 32 specifically noted otherwise in the Contract Documents and accepted submittals.
- 33

34 1.7 SYSTEMS TO BE COMMISSIONED

- 35
- 36 A. The following systems and their sub components are anticipated to be commissioned on this
- 37 project. The actual systems commissioned will be based on the systems listed in the
- 38 commissioning contract with the owner. Systems included for this project will be confirmed
- 39 during the CA construction phase.
- 40
- 41 B. These systems and sub-components will be commissioned using sampling techniques.
- 42 Percentage of sampling shall be determined by the CA in the field but no less than 20% of like
- 43 systems shall be sampled for HVAC systems and Lighting systems. All chillers, space heat
- 44 boilers and cooling towers, (except existing systems), shall be tested. No sampling will be
- 45 allowed for these major components (chillers, space heat boilers and cooling towers).
- 46 Reference the Mechanical, Electrical and Plumbing systems equipment schedules and sheets
- 47 contained in the contract drawings for equipment design information.
- 48

Cx Systems	Require Fx Testing	Items Tested
HVAC		
<input type="checkbox"/> Chilled Water Plants	Yes	Controls, Sequence of Operations, Alarms
<input type="checkbox"/> Hot Water Plants	Yes	Controls, Sequence of Operations, Alarms

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Cx Systems	Require Fx Testing	Items Tested
___ Air Handling Units	Yes	Controls, Sequence of Operations, Alarms, Economizer
___ Packaged Units (RTU and HP)	Yes	Controls, Sequence of Operations, Alarms, Economizer
___ Terminal Units/VAV's	Yes	Controls, Sequence of Operations, Alarms, Economizer
___ Exhaust and Relief fans	Yes	Controls, Sequence of Operations, Alarms
___ DDC Control System (<i>Component installation and System Operation</i>)	Yes	System calibration and function
Electrical Systems		
___ Lighting Controls	Yes	Control Software and Hardware Properly Adjusted and Programmed
___ Occupancy Sensors	Yes	Aiming, Status Indicator, Light Staging
___ Time Switch Controls	Yes	Programmed Schedules, Battery Backup, Override Limit, Simulate Occupied and Unoccupied Conditions
_ Daylight Responsive Controls	Yes	Accurate Locations, Calibration, Setpoint, Threshold
Plumbing Systems		
___ Service Water Heating Systems	Yes	Controls, Sequence of Operations, Alarms

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PART 2 PRODUCTS

2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform start-up and initial check-out and required functional performance testing shall be provided by the primary Division contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities. Two-way radios shall be provided as necessary for communication between the CA and contractors during performance testing, by the Division Contactor.
- B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and turned over to the owner for his use and shall become the sole property of the owner, except for temporary stand-alone data logging equipment that may be used by the CA and any special testing and inspection equipment used for testing of piping, ductwork and electrical and special systems unless such equipment is required for such systems to function and operate.
- C. Any and all data logging by electronic device shall be by the DDC control system where applicable, and as otherwise contracted by the owner with others.

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- D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year and a resolution of + or - 0.3°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 EXECUTION

3.1 REPORTING

- A. The CA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.
- B. Non-conformance and deficiency issues will be recorded on the commissioning issues log and a copy will be provided to the GC for making corrections. A copy will be provided to the owner and made available to other project team members as directed by the owner. Frequency of these reports will be determined by the progress of construction and issues discovered during the CA and owner site observations. Issues recorded on the Cx Issues Log will be noted as complete and the CA will initial the date and verified by block only after the CA has confirmed that the item has been corrected by the contractor or noted in writing, by the owner, as accepted as is by the owner.
- C. A final summary report (about four to six pages, not including backup documentation) by the CA will be provided to the owner, focusing on evaluating commissioning process issues and identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the summary report. As appropriate, checklists, functional tests and monitoring reports may be included to supplement the summary report. These documents will also be included in the Project Commissioning Record.

3.2 SUBMITTALS

- A. Normal submittal: For MEP Systems, submittals will be provided by the GC to the CA through the Architect and concurrently with the A/E consultants review period. At a minimum, the submittal will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and check-out materials that are actually shipped inside the equipment and the actual field check-out sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent. All documentation requested by the CA will be included by the Subs in their O&M manual contributions. Where items are uploaded to an ftp or web based site, the CA will be notified.
- B. The CA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.

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1 3.3 PHASED COMMISSIONING
2

3 A. Where the project requires TAB, start-up and performance testing to be executed in phases,
4 phasing shall be coordinated with the owner, GC, CA, and A/E and be reflected in the overall
5 project schedule and shall include commissioning activities in the schedule by the contractor.
6 Final performance testing of all systems will be as required by the phasing plan. The
7 performance testing of the “systems as a whole” will be performed before final turnover of the
8 project.
9

10 3.4 FUNCTIONAL PERFORMANCE TESTING
11

12 A. Requirements. The performance testing shall demonstrate that each system is operating
13 according to the documented design intent and contract documents. Performance testing
14 facilitates bringing the systems from a state of individual substantial completion to full dynamic
15 operation. Additionally, during the testing process, areas of deficient performance are
16 identified, corrected and the system retested, improving the operation of the systems.
17

18 B. Coordination and Scheduling. The contractor shall provide sufficient notice, regarding their
19 completion schedule for the construction checklists and start-up of all equipment and systems
20 to allow the performance testing to be scheduled. The commissioning team shall oversee,
21 witness, and document the performance all equipment and systems. The contractor in
22 association with the subcontractors shall execute the tests. The CA shall witness and
23 document the results of the test. Performance testing shall be conducted after the construction
24 checklists, and start-up has been satisfactorily completed. The control system shall be
25 sufficiently tested and approved by the CA and engineer of record before it is used, to verify
26 performance of other components or systems. The air side balancing and water side balancing
27 shall be completed before performance testing of air or water-related equipment or systems.
28 Testing proceeds from components to sub-systems to systems. When the proper performance
29 of all interacting individual systems has been achieved, the coordinated response between
30 systems shall be verified.
31

32 C. Development of Test Procedures.

33 1. Before test procedures are finalized, the contractor shall provide to the A/E and the CA
34 all requested documentation including changes affecting equipment or systems, an
35 updated control points list, control schematics, control sequences, and testing
36 parameters. Using the testing parameters and requirements in the technical
37 specifications, the CA shall develop and update specific testing requirements and
38 documentation for the purpose of verifying and documenting the actual performance of
39 the related systems and equipment. Each respective contractor/subcontractor or vendor
40 shall provide assistance to the CA as necessary and required in developing the final
41 equipment and systems test procedures. Should the CA test and the manufacturer test
42 requirement be at variance with one another, the manufacturer operational test
43 requirements shall prevail.

44 2. Before test procedures are written, the CA shall obtain all requested documentation and
45 a current list of change orders affecting equipment or systems, including an updated
46 points list, program code, control sequences and parameters. The CA shall develop
47 specific test procedures and forms to verify and document proper operation of each piece
48 of equipment and system. Each Sub or vendor responsible to execute a test, shall provide
49 assistance to the CA in developing the procedures review (answering questions about
50 equipment, operation, sequences, etc.). Prior to execution, the CA shall provide a copy
51 of the test procedures to the contractor who shall review the tests for feasibility, safety,
52 equipment and warranty protection. The CA may submit the tests to the A/E for review
53 and comment prior to performing the test.
54

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D. Test Methods.

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the building DDC control system.
2. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
3. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system shall be allowed, but simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a portable hot air device in lieu of overwriting the setpoint.
4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
5. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55°F, when the outside air temperature is above 55°F, temporarily change the lockout setpoint to be 2°F above the current outside air temperature.
6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during prefunctional testing.
7. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.
8. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. The specific recommended sampling rates are listed in these documents. It is noted that no sampling by Subs is allowed in CHECKLIST execution. A common sampling strategy referenced in the Specifications as the "xx% Sampling-yy% Failure Rule" is defined by the following example:
 - a. xx = the percent of the group of identical equipment to be included in each sample.
 - b. yy = the percent of the sample that if failing, will require another sample to be tested.
9. The example below describes a 20% Sampling—10% Failure Rule.
 - a. Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the "first sample."
 - b. If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
 - c. If 10% of the units in the second sample fail, test all remaining units in the whole group.
 - d. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CA may stop the testing and require the responsible Sub to perform and document a check-out of the remaining units, prior to continuing with functionally testing the remaining units.

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- 1 E. Coordination and Scheduling:
 - 2 1. The Subs shall provide sufficient notice to the CA regarding their completion schedule for
 - 3 the CHECKLISTS and start-up of all equipment and systems. The CA will schedule
 - 4 functional tests through the GC.
 - 5 2. The CA shall observe and document the results of functional testing if the results shall be
 - 6 provided to the owner and A/E for review and record.
 - 7 3. The Subs shall execute the tests. In general, functional performance testing is conducted
 - 8 after checklist verification and start-up has been satisfactorily completed and start-up
 - 9 reports and checklists have been reviewed by the A/E. The control system is sufficiently
 - 10 tested for completeness, by the controls contractor and prior to TAB work. The controls
 - 11 sub will provide written notification to the GC, A/E and CA that the controls have been
 - 12 inspected and pre-Tested prior to beginning TAB and any Functional testing work. The
 - 13 air balancing and water balancing is then completed and debugged before functional
 - 14 testing of air-related or water-related equipment or systems. Testing proceeds from
 - 15 components to subsystems to systems. When the proper performance of all interacting
 - 16 individual systems has been achieved, the interface or coordinated responses between
 - 17 systems is checked.
 - 18 a. Test Equipment. All standard testing equipment required to perform start-up and
 - 19 initial check-out and required functional performance testing shall be provided by the
 - 20 Division contractor for the equipment being tested. All testing equipment shall be of
 - 21 sufficient quality and accuracy to test or measure system performance as required
 - 22 by the construction documents and specifications and functional performance
 - 23 testing.
 - 24 b. Problem Solving. The CA will recommend solutions to issues discovered, however
 - 25 the burden of responsibility to solve, correct and retest problems is with the GC,
 - 26 Subs and A/E.

27
28 **3.5 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS**

- 29 A. Documentation. The CA shall witness and document the results of all functional performance
- 30 tests using the specific procedural forms developed for that purpose. Prior to testing, these
- 31 forms are provided to the A/E and GC for review and approval.
- 32
33 B. Non-Conformance.
 - 34 1. The CA will record the results of the functional test on the test form. All deficiencies or
 - 35 non-conformance issues shall be documented and reported to the GC for correction and
 - 36 a copy provided to the A/E and owner.
 - 37 2. Corrections of minor deficiencies identified may be made during the tests at the discretion
 - 38 of the CA. In such cases the deficiency and resolution will be documented on the
 - 39 procedure form.
 - 40 3. Every effort will be made to expedite the testing process and minimize unnecessary
 - 41 delays, while not compromising the integrity of the procedures. However, the CA will not
 - 42 be pressured into overlooking deficient work or loosening acceptance criteria to satisfy
 - 43 scheduling or cost issues, unless there is an overriding reason to do so at the request of
 - 44 the PM and CM. Any issue that requires more than 30 minutes to correct or multiple
 - 45 issues with a combined total of 90 minutes in any given day, shall be deemed failed and
 - 46 shall be documented as such by the Cx agent. A copy of the discrepancy shall be
 - 47 provided to the GC for correction and the project team members for record. Upon written
 - 48 notification from the GC, that the issue or issues are corrected and the system is fully
 - 49 operational and ready for retest, the CA will schedule with the GC for a retest of the failed
 - 50 system. Five working days shall be required by the GC in writing to the CA for any retest.
 - 51 4. As tests progress and a deficiency is identified, the CA discusses the issue with the
 - 52 executing contractor.
 - 53

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- 1 5. When there is no dispute on the deficiency and the Sub accepts responsibility to correct
2 it:
3 a. The CA documents the deficiency and the Sub's response and intentions and they
4 go on to another test or sequence. The CA submits the non-compliance reports to
5 the GC, A/E and owner. A copy is to be provided to the appropriate Sub by the GC.
6 The Sub corrects the deficiency, signs the statement of correction at the bottom of
7 the form certifying that the equipment is ready to be retested and sends it back to
8 the GC for verification. The GC provides a copy of the signed form to the A/E and
9 CA for record.
10 b. The CA reschedules the test and the test is repeated.
11 6. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is
12 responsible:
13 a. The deficiency shall be documented with the Sub's response and a copy given to
14 the GC, A/E, PM and CA and to the Sub representative assumed to be responsible.
15 b. Resolutions are made at the lowest management level possible. Other parties are
16 brought into the discussions as needed. Final interpretive authority is with the A/E.
17 Final acceptance authority is the owner.
18 c. The CA documents the resolution process.
19 d. Once the interpretation and resolution have been decided, the GC and CA will
20 reschedule the test and the test is repeated.
21 7. Cost of Retesting.
22 a. If a system scheduled for a Functional Performance Test fails to pass and perform
23 as designed, due to improper installation of start-up by the contractor, the cost for
24 retest including the CA's time and travel, will be charged to the General Contractor
25 who may choose to back charge his subs to recover any losses. Minor corrections
26 will be made on site and the test will continue where the total time for any given
27 system to be corrected and made fully operational, is less than 15 minutes.
28 b. For a deficiency identified, not related to any Checklists or start-up fault, the following
29 shall apply: The CA and GC will direct the retesting of the system once at no "charge"
30 to the sub or vendor for their time. However, the CA's time and expenses, incurred
31 due to additional retests of any system beyond the one retest, will be charged to the
32 GC, who will choose to recover costs from the responsible Sub.
33 c. The time for the CA and GC to direct any retesting required because a specific
34 Checklists or start-up test item, reported to have been successfully completed, but
35 determined during functional testing to be faulty, will be back charged to the GC,
36 who may choose to recover costs from the party responsible for executing the faulty
37 functional test.
38 8. The Contractor shall respond in writing to the CA, A/E and PM at least as often as
39 Commissioning meetings are being scheduled, concerning the status of each apparent
40 outstanding discrepancy identified during commissioning. Discussion shall cover
41 explanations of any disagreements and proposals for their resolution.
42 9. The CA retains the original Cx Issues Log until the end of the project.
43
44 C. Approval. The CA notes each satisfactorily demonstrated function on the test form. Formal
45 approval of the functional test is made after review by the CA, A/E and PM. The CA documents
46 the results of each test.
47

48 3.6 OPERATION AND MAINTENANCE MANUALS

- 49 A. Standard O&M Manuals.
50 1. The specific content and format requirements for the Standard O&M manuals are detailed
51 in the A/E's project specifications.
52 2. CA Review and Approval. Prior to substantial completion, the CA shall review the O&M
53 manuals, documentation and redline as-builds for systems that were commissioned and
54 as otherwise listed in these documents, to verify compliance with the Specifications. The
55 CA will communicate deficiencies in the manuals to the GC, PM or A/E, as requested.
56

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1 Upon a successful review of the corrections, the CA recommends approval and
2 acceptance of these sections of the O&M manuals to the GC, PM or A/E. The CA also
3 reviews the MEP and special systems equipment warranty information. This review by
4 the CA does not supersede the A/E's responsibility to review the O&M manuals according
5 to the A/E's contract.
6

- 7 B. Commissioning Record in O&M Manuals.
 - 8 1. The CA shall include the commissioning record as part of the close out documentation or
9 as a supplement to the O&M records. This shall be in electronic format for final
10 deliverables to the owner. The intended format is PDF format provided on electronic
11 medium/discs.

12
13 3.7 DEFERRED TESTING

- 14 A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building
15 structure, required occupancy condition or other deficiency, execution of checklists and
16 functional testing may be delayed upon approval of the PM. These tests will be conducted in
17 the same manner as the seasonal tests as soon as possible. Services of necessary parties
18 will be negotiated.
- 19 B. Seasonal Testing. Where seasonal testing is necessary or required to verify systems
20 performance under designed conditions, these Tests will be scheduled by the GC, in
21 coordination with the Owner and CA, and executed by the responsible Subs. The owner's
22 facilities staff and the CA shall be notified in writing, by the GC, of the dates such testing will
23 be conducted and shall be available for observing the testing. All such tests shall be scheduled
24 no later than 60 days from substantial completion and shall be conducted no later than seven
25 months from substantial completion. The owner shall have final approval for seasonal test
26 dates. Any adjustments required for updating the accuracy of the O&M manuals, warranties
27 and as-builts due to the testing will be made by the contractor.

28
29
30
31 3.8 WRITTEN WORK PRODUCTS

- 32 A. The commissioning process generates a number of written work products described in various
33 parts of the Specifications. The Commissioning Plan-Construction Phase, lists all the formal
34 written work products, describes briefly their contents, who is responsible to create them, their
35 due dates, who receives and approves them and the location of the specification to create
36 them. In summary, the written products are:
37
38

Product	Developed By
1. Final commissioning plan	CA
2. Commissioning schedule	GC/CA
3. Equipment documentation submittals	GC/Subs/A/E
4. Sequence clarifications	A/E/Vendors
5. Issues log (deficiencies)	CA/GC
6. Commissioning Progress Record	CA
7. Deficiency reports	CA/A/E/PM/GC
8. Functional test forms	CA/AE
9. Filled out functional tests	CA/GC/Subs
10. O&M manuals	GC/Subs
11. Commissioning record book	CA
12. Final commissioning report	CA
13. Final TAB report	TAB

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1 3.9 SAMPLE COMMISSIONING PLAN TEMPLATE

2
3 A. This section contains a sample commissioning plan in a document format. The sample
4 commissioning plan is displayed here to provide contractors with an example of a format and
5 rigor of the required documentation. The commissioning plan is subject to modification based
6 upon project requirements. Functional test will be issued for MEP systems during the submittal
7 phase.

8

IECC COMMISSIONING REPORT TEMPLATE

DATE

PROJECT NAME

PROJECT ADDRESS



ENGINEERING & CONSULTING

328 S. BROADWAY

TYLER, TEXAS 75702

903 581 2677

REGISTRATION NO. F-893

"Engineer's Signature"

Commissioning Plan template

“PROJECT TITLE”

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2.	<u>Abbreviations and Definitions</u>	3
3.	<u>Commissioning Process Description</u>	5
4.	<u>Construction Phase</u>	6
5.	<u>Occupancy and Operations Phase</u>	7
6.	<u>Contact Information</u>	9
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1. Commissioning Plan Overview

The Project Commissioning Plan provides a general description of the commissioning process to be used for the “PROJECT TITLE” project. The goals, intent, requirements, and timing of the process are included in the plan to provide a guide on how the process is to be executed and documented. A listing of the systems included in the commissioning process scope of work for this project is included in one of the appendices. These contract documents describe the process in more detail and also provide the Test Procedures, forms, and other requirements necessary to guide the commissioning activities.

The Project Commissioning Plan shall be supplemented and enhanced by the Commissioning Authority (CxA), Construction Manager (CM), and other contractors throughout the construction process to form the Project Commissioning Record at the end of the project. Throughout the commissioning process, the CxA shall revise the specific commissioning procedures and forms as necessary to suit project field conditions and actual approved manufacturer’s equipment, to incorporate test data and procedure results, and to provide detailed scheduling for all commissioning tasks. The completed Commissioning Plan shall become the owner’s Commissioning Record and shall provide a reference to system setup, test results, and operational data for the systems commissioned. Once complete and approved, the Project Commissioning Record is then re-organized and combined with other project closeout documentation to form the Systems Manual for the project.

2. Abbreviations and Definitions

The following are common abbreviations and definitions used in this document and throughout the commissioning process documentation:

A/E	Architect/Design Engineers	TP	Test Procedure
CxA	Commissioning Authority	GC	General contractor
CC	Controls contractor	MC	Mechanical contractor
Cx	Commissioning	CC	Construction Checklist
EM	Energy Manager	OR	Owner’s representative
Cx Plan	Commissioning Plan	Subs	Subcontractors to GC
EC	Electrical contractor	TAB	Test and balance contractor
FM	Facility Manager	MS	Maintenance Staff

Acceptance: A contractually defined action that permits an activity to commence or continue.

Basis of Design: A document that records the concepts, calculations, decisions, and product selections used to meet the Owner’s Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

Commissioning: See Commissioning Process.

Commissioning Activity: A component of the Commissioning Process.

Commissioning Authority: An entity identified by the owner who plans, schedules, and coordinates the commissioning team to implement the Commissioning Process.

Commissioning Field Report: A document that records the activities and results of the Commissioning Process.

Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the Commissioning Process.

Commissioning Process: A quality-focused process for enhancing the delivery of a project. The process focuses on verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's Project Requirements.

Commissioning Process Progress & Approval Form: A document that indicates activities completed as part of the Commissioning Process, approval status of the activities, and significant findings from those activities; it is continuously updated during the course of a project.

Commissioning Team: The individuals, who through coordinated actions, are responsible for implementing the Commissioning Process.

Construction Documents: This includes a wide range of documents, which will vary from project to project, owner's needs, regulations, laws, and countries. Construction documents usually include the project manual (specifications), plans (drawings) and General terms of the contract, especially those required by subcontractors and vendors, suppliers and manufacturers of equipment, assemblies and systems.

Contract Documents: This includes a wide range of documents, which will vary from project to project, owner's needs, regulations, laws, and countries. It frequently includes price agreements, construction management process, subcontractor agreements or requirements, requirements and procedures for submittals, changes, and other construction requirements, timeline for completion, and the Construction Documents.

Coordination Drawings: Drawings showing the work of all trades to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances.

Issues Log: A formal and ongoing record of problems or concerns – and their resolution – that have been raised by members of the Commissioning Team during the course of the Commissioning Process.

Owner's Project Requirements: A written document that details the functional requirements of a project and the expectations of how it will be used and operated. This includes project and design goals, measurable performance criteria, budgets, schedules, success criteria, and supporting information.

Probabilistic Tools: Tools and methods based upon an estimated, uniform or known probability/statistical distribution of outcome that can be predicted or an underlying outcome distribution that can be expected or estimated. The distribution of outcome should be within a reasonably close range to the mean expected outcome or measured value, be it known or estimated.

Systems Manual: A system-focused composite document that includes the Commissioning Record, operation manual, maintenance manual, and additional information of use to the owner during the Occupancy and Operations Phase.

Test Procedure: A written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.

Verification: The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner's Project Requirements.

3. Commissioning Process Description

The Commissioning Plan is a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the Commissioning Process. The BCA defines the basic purpose of commissioning as: *"The basic purpose of building commissioning is to provide documented confirmation that building systems function in compliance with criteria set forth in the project contract documents to satisfy the owner's operational needs. Commissioning of existing systems may require the development of new functional criteria in order to address the owner's current systems performance requirements."* This definition is based on the critical understanding that the owner must have some means of verifying that their functional needs are rigorously addressed during construction and acceptance.

The three main goals of the commissioning process are:

1. Facilitate the final acceptance of the project at the earliest possible date.
2. Facilitate the transfer of the project to the owner's maintenance staff.
3. Ensure that the comfort systems meet the requirements of the occupants.

Commissioning is also intended to achieve the following specific objectives:

- Document that equipment is installed and started per manufacturer's recommendations.
- Document system performance with thorough functional performance testing and monitoring.
- Verify the completeness of operations and maintenance materials.
- Control point-to-point checks.

The contractor verifies installation, provides scheduling and coordination of commissioning activities, conducts test, corrects deficiencies, performs re-tests, and provides documentation of the process. The Commissioning Authority (CxA) provides the owner an unbiased, objective view of the systems installation, documentation, operation, and performance. Commissioning procedures and results are observed by the CxA. The contractor is expected to verify the functional readiness of systems to be tested prior to performing the tests in the presence of the witnesses. A high rate of test failure will indicate that the contractor has not adequately verified the readiness of the systems.

This plan is the key means for the CxA to inform all parties as to how each system functions independently and with respect to other systems. This plan shall be updated regularly and redistributed to the commissioning team for review and comment.

The following marked systems will be commissioned in this project. All general references to equipment in this document refer only to equipment that is to be commissioned.

System	Equipment	Quantity	Functional Tests
HVAC System	Chillers		Sequence of operation, economizer, alarms, controls
	Pumps		

System	Equipment	Quantity	Functional Tests
	Cooling tower		
	Boilers		
	Piping systems		
	Ductwork		
	Variable frequency drives		
	Air handlers		
	Packaged AC units		
	Packaged HP units		
	Terminal units		
	Unit heaters		
	Heat exchangers		
	Fume hoods		
	Lab room pressures		
	Exhaust fans		
	HVAC control system		
	Fire and smoke dampers		
Electrical System	Sweep or scheduled lighting controls		Sequence of operation, settings, sensitivity, controls
	Daylight dimming controls		
	Lighting occupancy sensors		
	Time Switch Controls		
Other	Service water heaters		

4. Construction Phase

Submittals

The general contractor will provide the CxA with a set of equipment and system submittals. This equipment data includes installation and start-up procedures, O&M data, performance data and temperature control drawings. The subcontractors, GC or A/E notify the commissioning authority of any new OPR or operating parameter changes, added control strategies and sequences of operation, or other change orders that may affect commissioned systems.

Verification during the Construction Phase

Verification is a systematic process of ensuring that all building systems perform interactively according to the OPR and operational needs. This is achieved by beginning in the Construction Phase and continuing through the occupancy and operations period with actual verification of performance prior to occupancy.

Verification during the construction of this project is intended to achieve the following specific objectives according to the Contract Documents:

- Ensure that applicable equipment and systems are installed properly
- Verify and document proper performance of equipment and systems compared to what design calls for compared to what design calls for.
- Ensure that O&M documentation is complete.
- Verify that adequate and accurate system and assembly documentation is provided to the owner.
- Utilize quality-based sampling techniques to detect systemic problems.
- At minimum, testing shall affirm winter and summer design conditions and full outside air conditions.

Commissioning Record

The Project Commissioning Record is the original Project Commissioning Plan updated throughout the project and augmented with completed checklists, Test Procedures and data, and other attachments and reports collected through the commissioning process. The Commissioning Record is incorporated in the final project Systems Manual.

5. Occupancy and Operations Phase

Commissioning Issues and Retesting

The CxA records the results of the functional test on the procedure or test form. All deficiencies identified during the verification testing are documented on an issues list standard form and reported to the owner. The deficiency report includes all details of the components or systems found to be non-compliant with the parameters of the test plans. The report details the adjustments or alterations required to correct system operation, at which time owner will identify the responsible party.

Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA with the concurrence of the owner. In such cases the deficiency and resolution will be documented on the procedure form. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.

For identified deficiencies:

If there is no dispute on the deficiency and the responsibility to correct it:

The CxA documents the deficiency and the adjustments or alterations required to correct it. The contractor corrects the deficiency and notifies the CxA that the equipment is ready to be retested. The CxA reschedules the test and the test is repeated.

If there is a dispute about a deficiency or who is responsible:

The deficiency is documented on the issues form and a copy given the CM/OR. Resolutions are made at the lowest management level possible. Final interpretive authority is with the CM/OR and the A/E. The CxA documents the resolution process.

Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency and notifies the CxA that the equipment is ready to be retested. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.

Deferred Testing

Unforeseen Deferred Tests: If any test cannot be completed due to the building structure, required occupancy condition, or other deficiency, the functional testing may be delayed upon approval of the owner. These tests are conducted in the same manner as the seasonal tests as soon as possible.

Seasonal Testing: Seasonal variation in operations or control strategies may require additional testing during the opposite season to verify performance of the HVAC system and controls. During the warranty period, seasonal testing and other deferred testing is completed as required to fully test all sequences of operation. Operation coordinates these activities. Tests are executed and documented, with deficiencies corrected by the appropriate contractors. Any final adjustments to the O&M manuals and as-builts due to the testing are also completed.

Facility Staff Participation:

The facilities operating staff at the direction of the owner may participate in the testing process.

Sampling:

At the discretion of the CxA, multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy.

Sequence of testing:

1. The verification begins with equipment or assembly delivery and continues through start-up and testing.
2. Other sequencing requirements, depending upon the specific system, may be required to ensure the proper conditions are present or can be created.
3. A specified test is run per construction documents or per manufacturer's requirements.

Standard O&M Manuals

As part of the commissioning process, the CxA reviews the O&M manuals, documentation and redline as-builts for systems that were commissioned to verify compliance with the OPR and Specifications.

Systems Manual

The Systems Manual is intended to be a usable information resource containing all of the information related to the systems, assemblies, and commissioning process in one place with indexes and cross references.

Final Commissioning Report

After completion of all commissioning activities, the Commissioning Authority will write a final report documenting the overall results of the commissioning process and recommending acceptance of the commissioning process and related documentation to the owner.

The final commissioning report will include an overview or summary of the commissioning process, major results of the process, the final commissioning issues log and resolutions, commissioning progress and field reports, a deferred testing log, an unresolved issues log, a lessons-learned evaluation, and concluding with a recommendation to accept the process as complete.

6. Contact Information

The following table indicates individual contacts for each organization involved in the commissioning process:

Team Member	Contact Names	Voice, office, cell, fax, email address	
Owner:		Address	
Project Manager:		City/State/Zip	
		Phone	
		Cell/Fax	
		E-Mail	
Other Contact:		Address	
		City/State/Zip	
		Phone	
		Cell/Fax	
		E-Mail	
Construction Manager:		Address	
Project Manager:		City/State/Zip	
		Phone	
		Cell/Fax	
		E-Mail	
Project Engineer:		Address	
		City/State/Zip	
		Phone	
		Cell/Fax	
		E-Mail	

Commissioning Authority:		Address	
Commissioning Authority:		City/State/Zip	
		Phone	
		Cell/Fax	
		E-Mail	
Project Manager:		Address	
		City/State/Zip	
		Phone	
		Cell/Fax	
		E-Mail	
Architect/Engineer:		Address	
Architect:		City/State/Zip	
		Phone	
		Cell/Fax	
		E-Mail	
Mechanical Engineer:		Address	
		City/State/Zip	
		Phone	
		Cell/Fax	
		E-Mail	
Electrical Engineer:		Address	
		City/State/Zip	
		Phone	
		Cell/Fax	
		E-Mail	

General Contractor:		Address	
Project Manager:		City/State/Zip	
		Phone	
		Cell/Fax	
		E-Mail	
Superintendent:		Address	
		City/State/Zip	
		Phone	
		Cell/Fax	
		E-Mail	
TAB Contractor:		Address	
Project Manager:		City/State/Zip	
		Phone	
		Cell/Fax	
		E-Mail	
BAS Contractor:		Address	
Project Manager:		City/State/Zip	
		Phone	
		Cell/Fax	
		E-Mail	

7. Schedule Requirements

The following sequential priorities are followed:

1. System verification testing is not begun until Construction Checklists and start-up and TAB is completed, for a given system. System ready to balance checklist must be submitted to Operations.
2. The controls system and equipment it controls are not functionally tested until all points have been calibrated and Construction Checklists are completed.
3. TAB is not performed until the controls system has been started, sufficiently functionally tested, and approved by the A/E.
4. TAB is not performed until the envelope is completely enclosed and ceilings are complete, unless the return air is ducted.

8. Index of Appendices

- Appendix A - Project Specifications
- Appendix B - Communication Structures
- Appendix C - Roles and Responsibilities
- Appendix D - Commissioning Process Issues
- Appendix E - Commissioning Test Procedures
- Appendix F - Systems Manual

Appendix A – Project Specifications

Commissioning language in the specifications details the scope of commissioning for this project. The following table lists the sections of the specifications that may include commissioning related language required for this project. Additional requirements may be included in each sub section.

Mechanical and lighting systems are to be commissioned per 2015 IECC code and requirements.

Appendix B – Communication Structures

General Management Plan and Protocols

The following protocols will be used on this project:

Table D.1: General Management Protocols

Issue	Protocol
For requests for information (RFI) or formal documentation requests:	The CxA goes first through the CM or OR
For minor or verbal information and clarifications:	The CxA goes direct to the CM or OR
For notifying contractors of deficiencies:	The CxA documents deficiencies through the CM or OR, but may discuss deficiency issues with contractors prior to notifying the CM or OR
For scheduling tests or training:	The CxA provides input and coordination of testing and training. Scheduling is done through the CM or OR.
For scheduling commissioning meetings:	The CP selects the date and schedules through the CM or OR.
For making a request for significant changes:	The CxA has no authority to issue change orders.
For making minor changes in specified sequences of operations:	Any required changes in sequences of operations required to correct operational deficiencies must be approved and documented by the CM/OR and A/E team. The CxA may recommend changes in sequences of operation to improve efficiency or control.
Subcontractors disagreeing with requests or interpretations by the CxA shall:	Resolve issues at the lowest level possible. First with the CxA, who obtains approval from the CM or OR then with the GC. Some issues may require input from the A/E team.

Appendix C – Roles and Responsibilities

Descriptions and explanations of the roles and responsibilities of those in the commissioning process are found below:

General Descriptions of Roles

General descriptions of the commissioning roles are as follows:

CxA:	Coordinates the CX process, writes Construction Checklists and test Procedures and reviews testing plans, start-up procedures and directs and documents performance testing.
OR:	Facilitates and supports the CX process and gives final approval of the CX work.
FM:	Coordinates maintenance staff participation in commissioning activities.
GC:	Facilitates the CX process, ensures that Subs perform their responsibilities and integrates CX into the construction process and schedule.
Subs:	Demonstrate correct system performance.
Staff:	Participate in commissioning tasks and performance testing, review O&M documentation, and attend training.
A/E:	Perform construction observation, approve O&M manuals and assist in resolving problems.
Mfr.:	Equipment manufacturers and vendors provide documentation to facilitate the commissioning work and perform contracted startup.

Specific Roles and responsibilities

Owner's Representative (OR):

1. Assign operations and maintenance personnel and schedule them to participate in the various meetings, training sessions, and observations/inspections as follows:
 - a. Construction Phase coordination meetings.
 - b. Initial owner training session at initial placement of major equipment.
 - c. Maintenance orientation and inspection.
 - d. System testing verification meetings.
 - e. Procedures meeting for testing systems.
 - f. Owner's training session.
 - g. Verification demonstrations.
 - h. Systems and assemblies tests.
 - i. Final review at acceptance meeting.
2. Review and approve any changes made to Owner's Project Requirements.
3. Review and approve the Construction Documents.
4. Review and comment on the Commissioning Authority's Commissioning Process Progress Reports.
5. Review and comment on the Commissioning Authority's verification reports.
6. Review and accept the Commissioning Authority's Commissioning Process Report.

Commissioning Authority (CxA):

1. Organize and lead the Commissioning Team.
2. Identify specialists who will be responsible for accomplishing the Commissioning Process activities for specific systems and assemblies
3. Provide Commissioning Process activities to the GC for inclusion into the project schedule
4. Execute the Commissioning Process through the writing and review of Commissioning Process Reports, organization of all Commissioning Team meetings, tests, demonstrations, and training events described in the Contract Documents and approved Commissioning Plan.
5. Organizational responsibilities include preparation of agendas, attendance lists, and arrangements for facilities, and timely notification to participants for each Commissioning Process activity.
6. The Commissioning Authority shall act as chair at all commissioning events and ensure execution of all agenda items.
7. Review the following submittals: coordination drawings, shop drawings, product data, and training program for compliance with the Owners Project Requirement.
8. Develop Test Procedures to carry out the tests that are accomplished during this phase
9. Develop the initial format to be used for Issues Logs throughout and for each phase of the Commissioning Process.
10. Review proposed contractor-provided training program to verify that the Owner's Project Requirements are achieved.
11. Attend a portion of the contractor-provided training sessions to verify that the Owner's Project Requirements are achieved.
12. Update the Systems Manuals to incorporate materials generated during the Construction Phase. Update material that originated in earlier phases of the project. Add new materials such as the following to the manuals, such as Test Procedures and test data records, training plans, training records and record drawings. Verify that it achieves the Owner's Project Requirements. Insert systems descriptions as provided by the design professional(s) in the Systems Manual.
13. Identify diagnose, and track issues and deviations relating to the Construction Documents and the Owner's Project Requirements and document resolution of same.
14. Supervise the Commissioning Team members in completion of tests. The test data will be part of the Commissioning Process Report.
15. Verify that the Systems Manual and all other design and construction records have been updated to include all modifications made during the Construction Phase.
16. Repeat implementing of tests to accommodate seasonal tests or to correct any performance deficiencies. Revise and resubmit the Commissioning Process Report as required.

17. Prepare the final Commissioning Process Report.
18. Assemble the final documentation, which includes the Commissioning Process Report, the Systems Manual, and all record documents. Submit this documentation to the owner for review and acceptance.
19. Recommend acceptance of the individual systems and assemblies to the owner (in accord with the defined project requirements).
20. Keep the Commissioning Team informed of decisions that result in modifications to the Owner's Project Requirements.

Design Professional (A/E):

1. Document the Basis of Design.
2. Attend the pre-construction meetings as scheduled by the Commissioning Authority.
3. Participate in the initial operation and maintenance personnel and occupant training session by presenting the project Basis of Design.
4. Participate in other training as detailed in the training program.
5. Review Test Procedures submitted by the Commissioning Authority.
6. Review and comment on the Commissioning Authority's periodic Commissioning Process Progress Reports and Issues Log reports.
7. Review and accept record documents as required by Contract Documents.
8. Review and comment on the final Commissioning Process Report.
9. Recommend final acceptance of the systems to the owner.

Construction Manager (CM):

1. Include Commissioning Process requirements and activities in all contractors' contracts.
2. Provide acceptable representation with the means and authority to prepare and coordinate implementation of the Commissioning Process as detailed in the Contract Documents.
3. Issue a statement certifying that all work has been completed and that the facility is operational, in accordance with Contract Documents.
4. Issue the appropriate final reports to the design professionals for review and acceptance.
5. Facilitate the remedy of deficiencies identified by the Commissioning Authority during verification of the installation or testing.
6. Review and comment on the final Commissioning Process Report.

Contractor (GC):

1. Include Commissioning Process requirements and activities in each purchase order or subcontract written.
2. Obtain cooperation and participation of all subcontractors and manufacturers.
3. Attend the pre-construction and Commissioning Team meetings.

4. Implement the training program as detailed in the Contract Documents.
5. Provide submittals to the owner, design professionals, and the Commissioning Authority.
6. Notify the Commissioning Authority when systems and assemblies are ready for testing.
7. Demonstrate the performance of assemblies and/or operation of systems to the Commissioning Authority.
8. Complete the Construction Checklists as the work is accomplished. Provide the completed Construction Checklists to the Commissioning Authority through the owner.
9. Continuously maintain the Record Drawings and submit as detailed in the Contract Documents.

Manufacturers, Vendors, Suppliers (Mfr.):

1. Provide all information required for the operation and maintenance of the system or assembly as part of the initial submittal.
2. Provide the requirements to maintain the warranty as part of the initial submittal.
3. Coordinate and accomplish factory tests as detailed in the Contract Documents.
4. Provide training as detailed in the training program contained in the Contract Documents.

Demonstrate operation and performance of the system or assembly as detailed in the Contract Documents

Appendix D – Commissioning Process Issues

<Insert Punch list>

Appendix E – Commissioning Test Procedures

<Insert test procedure forms and attachments>

Appendix F – Systems Manual

<Refer to Systems Manual Requirements document for further information. Insert requirements for Systems Manual here.>

END OF SECTION

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
GALENA PARK INDEPENDENT SCHOOL DISTRICT**

SECTION 02 07 00

SELECTIVE DEMOLITION

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of contract, including General and Supplementary Conditions, Division-1, and Division 0 Specification sections, apply to work of this section.

DESCRIPTION OF WORK:

Extent of selective demolition work is indicated on drawings.

Types of Selective Demolition Work. Demolition requires the selective removal and subsequent off-site disposal in a legal manner of the following items but not limited to:

- Removal of selective piping and items.
- Removal of rooftop units, curbs, ductwork etc. as shown on plans or as required.
- Other items shown on plans, and required for new installation.
- Other items required for installation of work. Replace as required and necessary.
- Other items not needed for new installations.
- Related Work specified elsewhere:

Remodeling construction work and patching is included within the respective sections of specifications, including removal of materials for re-use and incorporated into remodeling or new construction.

Relocation of pipes, conduits, ducts, other mechanical and electrical work are specified by respective trades.

Should any asbestos-containing material be encountered, Contractor shall stop work immediately and contact Owner and Owner's Representative before proceeding with work. The cost of asbestos abatement and removal is not included as part of this contract. The Owner will provide separate Contractors for this work should it be required. However, should the Contractor fail to comply with above stated requirement he will be charged the costs incurred by the Owner for the asbestos clean-up process as a result of the Contractor's actions which disturb any asbestos containing materials. Contact Owner regarding any asbestos information.

SUBMITTALS:

Schedule:

Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Owner's Representative for review prior to commencement of work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection.

Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.

Coordinate with Owner's occupation of portions of existing building.

JOB CONDITIONS:

Occupancy:

Owner may be continuously occupying areas of the building. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum 72 hours advance notice to Owner of demolition activities which will severely impact Owner's normal operations.

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- 1 Condition of Structures:
2 Owner and Engineer assumes no responsibility for actual condition of times or structures to be
3 demolished.
4
- 5 Partial Demolition and Removal:
6 Items indicated to be removed but of salvable value to Contractor may be removed from structure as
7 work progresses. Transport salvage items from site as they are removed.
8 Storage and sale of removed items on-site will not be permitted.
9
- 10 Protections:
11 Provide temporary barricades and other forms of protection as required to protect Owner's personnel
12 and general public from injury due to selective demolition.
13
14 Provide protective measures as required to provide free and safe passage of Owner's personnel and
15 general public to and from occupied portions of building.
16
17 Erect temporary covered passageways as required by authorize having jurisdiction.
18
19 Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse
20 or structure or element to be demolished, and adjacent facilities or work to remain.
21
22 Protection from damage existing finish work that is to remain in place and becomes exposed during
23 demolition operations.
24
25 Protect floors with suitable coverings when necessary.
26
27 Protect all equipment, furnishings and school property.
28
29 Construct temporary insulated solid dustproof partitions where required to separate areas where noisy
30 or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security
31 locks if required.
32
33 Provide temporary weather protection design interval demolition and removal of existing construction
34 on exterior surfaces, and installation of new construction to insure that no water leakage or damage
35 occurs to structure or interior areas of existing buildings.
36
37 Remove protections at completion of work.
38
- 39 Damages:
40 Promptly repair damage caused to adjacent facilities by demolition work at no cost to Owner.
41
- 42 Traffic:
43 Conduct selective demolition operations and debris removal in a manner to ensure minimum
44 interference with roads, streets, walks, and other adjacent occupied or used facilities.
45
- 46 Explosives:
47 Use of explosives will not be permitted.
48
- 49 Utility Services:
50 Maintain existing utilities keep in service, and protect against damage during demolition operations.
51
52 Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing
53 by authorized having jurisdiction. Provide temporary services during interruptions to existing utilities, as
54 acceptable to governing authorities.
55

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1 Environmental Controls:
2 Comply with governing regulations pertaining to environmental protection.
3 Do not burn on the site.

4
5 PART 3 - EXECUTION

6
7 PREPARATION:

8 Cease operations and notify the Owner's representative immediately if safety of structure appears to be
9 endangered. Take precautions to support structure until determination is made for continuing operations.

10
11 Cover and protect furniture, equipment and fixtures to remain from soiling or damage when demolition
12 work is performed in rooms or areas from which such items have not been removed.

13
14 Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes or
15 occupied areas or areas not involved in renovation work.

16
17 Provide weatherproof closures for exterior openings from demolition work.

18
19 Protection of Roof:

20 The Contractor and Subcontractors shall accomplish work in such a manner to protect roof. do not roll
21 equipment across roof. Contractor shall be responsible for any damage to roof.

22
23 Demolition:

24 Perform selective demolition work in a systematic manner. Use such methods as required to complete
25 work indicated on Drawings in accordance with demolition schedule and governing regulations.

26
27 Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with
28 construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact
29 tools.

30
31 Locate demolition equipment throughout structure and promptly remove debris to avoid imposing
32 excessive loads on supporting walls, floors or framing.

33
34 Provide services for effective air and water pollution controls as required by local, state, and federal
35 authorities having jurisdiction.

36
37 If unanticipated mechanical, electrical or structural elements which conflict with intended function or
38 design are encountered, investigate and measure both nature and extent of the conflict. Submit report
39 to Owner's Representative in written accurate detail. Pending receipt of directive from Owner's
40 Representative rearrange selective demolition schedule as necessary to continue overall job progress
41 without delay.

42
43 Disposal of Demolition Materials:

44 Remove debris, rubbish and other materials resulting from demolition operations from building site.
45 Transport and legally dispose of materials off site.

46
47 If hazardous materials are encountered during demolition operations, comply with applicable
48 regulations, laws and ordinances concerning removal, handling and protection against exposure or
49 environmental pollution. If asbestos is encountered, do not disturb. Contact Engineer and Owner.

50
51 Burning of removed materials is not permitted on project site.

52
53 Refrigerants shall not be released to the environment.

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- 1 Clean-Up and Repair:
- 2 Upon completion of demolition work, remove tools, equipment and demolished materials from site.
- 3 Remove protections and leave interior areas broom clean.
- 4
- 5 Repair demolition performed in excess of that required. Return structures and surfaces to remain to
- 6 condition existing prior to commencement of selective demolition work. Repair adjacent construction or
- 7 surfaces soiled or damaged by selective demolition work.
- 8
- 9

END OF SECTION

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
GALENA PARK INDEPENDENT SCHOOL DISTRICT**

PLUMBING

DIVISION 22

22 00 10	Basic Plumbing Requirements
22 00 90	Plumbing Submittal Procedures
22 05 24	Valves General
22 05 30	Pipe and Pipe Fittings General
22 05 54	Plumbing Identification
22 07 20	Piping Insulation
22 16 01	Natural Gas Piping and Appurtenances

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
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SECTION 22 00 10

BASIC PLUMBING REQUIREMENTS

PART 1 GENERAL

1.1 DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

- A. Basic plumbing requirements necessary to provide complete installation of all Division 22 work.

1.3 WORK INCLUDED

- A. This section of work comprises furnishing of all materials, equipment, tools, scaffolding, rigging, hoisting, labor and transportation necessary for the complete installation of the plumbing systems as shown on the plans and as specified herein.
- B. Bidders shall determine the contents of a complete set of drawings and specifications and be aware that they may be bidding from a partial set of drawings, applicable only to the various separate contracts, subcontracts, or trades as may be issued for bidding purposes only. The contract documents and the complete scope of work for the project are illustrated on the combined Architectural, Structural, Mechanical, Heating, Ventilating, Air Conditioning, Plumbing and Electrical, and each Bidder shall thoroughly acquaint himself with all the details of the complete set of drawings and specifications before submitting his bid.
- C. All drawings and specifications form a part of the contract documents for each separate contract and shall be considered as bound therewith in the event partial sets of plans and specifications are issued for bidding only. The submission of bids shall be deemed evidence of the review and examination of all drawings, specifications, and addenda issued for this project as no allowances will be made because of unfamiliarity with any portion of the complete set of documents.
- D. Plumbing Contractor is responsible for all final connections to specified plumbing fixtures and all owner furnished equipment requiring plumbing (drain, water, gas, condensate, air).

1.4 RELATED SECTIONS

- A. The conditions of the Division 01 requirements and the contract requirements which include the General Conditions and the Supplementary Conditions apply to the work of this division.

1.5 CODES & REFERENCE STANDARDS

- A. General
 - 1. Perform all Division 22 work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are modified by the contract documents.
 - 2. Nothing in the Contract Documents shall be construed to permit work not conforming to these codes.
 - 3. When two or more codes or standards are applicable to the same work, then the stricter code or standard shall govern.

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4. The date of the code or standard that is in effect on the date of issue of the contract documents except when a particular publication date is specified.
5. The Contractor shall be held responsible for verifying all local codes and ordinances that may alter any part of the plans or specifications. The Contractor shall bear all costs for correcting the deficiencies.
6. Where local codes and ordinances are not in writing or on record but a local precedence has been set, the Owner shall pay for any additional cost incurred.

1.6 APPLICABLE CODES AND STANDARDS FOR ALL DIVISIONS 22 WORK

- A. International Building Code
- B. International Gas Code
- C. International Plumbing Code
- D. International Mechanical Code
- E. International Energy Conservation Code
- F. National Electrical Code
- G. American Society of Heating, Refrigerating and Air Conditioning Engineers Standards.
- H. Occupational Safety and Health Administration Standards:
 1. OSHA Standard 2207 - Construction Industry Standards
 2. OSHA 29 CFR Part 1926 - Regulation of Excavation
 3. Texas Underground Facility Damage Prevention Act (H.B. 2295)
 4. All other applicable standards
- I. National Fire Protection Association:
 1. NFPA No. 90A Installation of Air Conditioning and Ventilating Systems
- J. Fire Sprinkler System:
 1. NFPA 13
 2. NFPA 14
 3. NFPA Life Safety Code 101 Section 8-3
 4. All other applicable codes
- K. National Appliance Energy Conservation Act of 1987
- L. Texas State Board of Insurance Standards
- M. Clean Air Act and Clean Air Act Amendments of 1990
- N. State Codes:
 1. Texas Department of Labor Boiler Rules and Regulations
 2. All other applicable codes
- O. Local Municipal Codes and Ordinances
- P. Schedule of Abbreviations:
 1. Reference Standards are listed in Division 22 using abbreviations listed below:

AABC	Associated Air Balance Council
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act

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1	AGA	American Gas Association
2	ANSI	American National Standards Institute
3	ASME	American Society of Mechanical Engineers
4	ASPE	American Society of Plumbing Engineers
5	ASTM	American Society for Testing and Materials
6	AWE	American Welding Society
7	AWWA	American Water Works Association
8	CISPI	Cast Iron Soil Pipe Institute
9	CS	Commercial Standard
10	CSA	Canadian Standards Association
11	DIPRA	Ductile Iron Pipe Research Association
12	DOT	Department of Transportation
13	DOC	Department of Commerce
14	FCC	Federal Communications Commission
15	FM	Factory Mutual
16	FS	Federal Specification
17	IBC	International Building Code
18	ITL	Independent Testing Laboratories
19	NEC	National Electric Code
20	NFPA	National Fire Protection Association
21	NSF	National Sanitation Foundation
22	OSHA	Occupational Safety and Health Administration
23	PDI	Plumbing and Drainage Institute
24	SMACNA	Sheet Metal and Air Conditioning National Association
25	TDH	Texas Department of Health
26	TWC	Texas Water Commission
27	UL	Underwriters Laboratories

28

29 1.7 QUALITY ASSURANCE

30

31

- A. Provide complete installations of all systems.
- B. Furnish all items of equipment, material, and labor to complete the Contract even though each and every item necessary is not specifically mentioned or shown.
- C. In case of any conflict between the specifications, plans and ordinances, the ordinances shall govern.
- D. All materials furnished under this Contract shall be new, free from defects of any kind, of the quality and design hereinafter specified, and shall conform to the standards of Underwriter's Laboratories Inc., except for equipment which U.L. does not list or provide label service.
- E. All plumbing equipment and fixtures shall be the same brand unless scheduled differently on plans.

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1.8 CONTRACTOR'S RESPONSIBILITY

- A. Erect barricades, protective fencing, and signs to prevent injury to personnel on site.
- B. Make permanent connection to utilities or existing lines. Determine depth and location, and bid accordingly.
- C. Relocate and repair any existing lines cut by general construction work.
- D. Pay all costs in connection with metering devices.

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- 1 E. Plans do not show exact location and elevations of lines, nor do they show all offsets required.
- 2
- 3 F. Deviate from plans as required to conform to the general construction and provide proper
- 4 grading.
- 5
- 6 G. Maintain all utility services during construction to existing portions of job that remain.
- 7
- 8 H. Procure and pay for all necessary permits or licenses to carry out the work.
- 9
- 10 I. Obtain and pay for all the necessary certificates of approval which must be delivered to the
- 11 Engineer before final acceptance of the work.
- 12
- 13 J. Periodically remove rubbish, clean or repair all surfaces marred by the work required under
- 14 this contract.
- 15
- 16 K. Protect work from damage by other trades.
- 17
- 18 L. Make all tests required by law; pay all costs in connection with the testing.
- 19
- 20 M. Where job conditions require changes in indicated locations and arrangement, make such
- 21 changes without extra cost to Owner.
- 22
- 23 N. Provide motor starters, controls, relays, all low-voltage wiring, conduit and wiring related to
- 24 plumbing and other equipment and devices to form a complete working system. See Division
- 25 26 00 00.
- 26

27 1.9 DEFINITIONS

- 28
- 29 A. Approval:
- 30 1. It is understood that approval must be obtained from the Engineer in writing before
- 31 proceeding with the proposed work.
- 32 2. Approval by the Engineer of any changes, submitted by the Contractor will be considered
- 33 as general only to aid the Contractor in expediting his work.
- 34
- 35 B. Contractor:
- 36 1. The Contractor engaged to execute the work included in a particular section only, even
- 37 though he may be technically described as a Subcontractor to the General Contractor.
- 38 2. If the Contractor engaged to execute said work employs Sub-Contractors to perform
- 39 various portions of the work included under this Section, he shall be held responsible for
- 40 the execution of same, in full conformity with Contract Document requirements.
- 41 3. The Contractor shall cooperate at all times and shall be responsible for the satisfactory
- 42 cooperation of his Subcontractors with the other Contractors on the job so that all of the
- 43 various phases of the work may be properly coordinated without unnecessary delays or
- 44 damage to any parts of the work of any Contractor.
- 45
- 46 C. Provide:
- 47 1. Defined as requiring the furnishing and installing of the item or facility indicated, complete
- 48 in all respects and ready for operation unless otherwise specifically noted.
- 49

50 1.10 WARRANTY

- 51
- 52 A. The Contractor shall warranty his work against defective materials and workmanship for a
- 53 period of one year from date of acceptance of the job.
- 54
- 55 B. Neither the final payment nor any provisions in Contract Documents shall relieve the
- 56 Contractor of the responsibility for faulty materials or workmanship.

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- 1
2 C. He shall remedy any defects due thereto, and pay for any damage to other work resulting
3 therefrom, which shall appear within a period of one year from date of substantial completion.
4
5 D. The Owner shall give notice of observed defects with reasonable promptness.
6
7 E. This Guarantee shall not be construed to include the normal maintenance of the various
8 components of the system covered by these specifications.
9

10 1.11 SITE VISIT

- 11
12 A. Before submitting his proposal, each bidder shall examine all plans and specifications relating
13 to the work, shall visit the site of the project and become fully informed of the extent and
14 character of the work required.
15
16 B. No consideration will be granted for any alleged misunderstanding of the materials to be
17 furnished or the amount of work to be done, it being fully understood that the tender of a
18 proposal carries with it the agreement to all items and conditions referred to herein, or
19 indicated on the accompanying plans or required by nature of the site of which may be fairly
20 implied as essential to the execution and completion of any and all parts of the work.
21

22 1.12 PROJECT RECORD DOCUMENTS

- 23
24 A. The Contractor shall keep a set of plans on the job, noting daily all changes made in
25 connection with the final installation including exact dimensioned locations of all new and
26 uncovered existing utility piping outside the building.
27
28 B. Upon submitting his request for final payment, he shall turn over to the Engineer, for
29 subsequent transmittal to the Owner, a clean, neatly marked set of reproducible plans showing
30 "as installed" work and an electronic file with changes of materials.
31
32 C. In addition to the above, the Contractor shall accumulate during the job's progress the
33 following data, in duplication (2 each), prepared in 3 ring binders of sufficient size, black in
34 color, neat in appearance, and turned over to the Engineer for checking and subsequent
35 delivery to the Owner:
36 1. All warranties, guarantees and manufacturer's directions on equipment and material
37 covered by the Contract.
38 2. Approved fixture brochures.
39 3. Copies of reviewed shop drawings.
40 4. Set of operating instructions. Operating instructions shall also include recommended
41 maintenance.
42 5. Any and all other data and/or plans required during construction.
43 6. Repair parts lists of all major items and equipment including name, address and
44 telephone number of local supplier or agent.
45 7. The first page, or pages, shall have the names, addresses, and telephone numbers of
46 the following:
47 a. General Contractor and all sub-contractors.
48 b. Major Equipment Suppliers.
49

50 1.13 TRAINING

- 51
52 A. Upon completion of the work and at a time designated by the Owner's representative, provide
53 a formal training session for the Owner's operating personnel to include location, operation,
54 and maintenance of all plumbing equipment and systems, some sections have further
55 instructions.
56

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- 1 B. Before proceeding with instruction, prepare a typed outline in triplicate listing the subjects that
- 2 will be covered. Submit the outline for review by the Owner's representative.
- 3
- 4 C. At the conclusion of the instruction, obtain the signatures of the attendees on each copy of the
- 5 outline to signify that they have a proper understanding of the operation and maintenance of
- 6 the system. Submit the signed outlines to the Owner's representative and Engineer as a
- 7 condition of final acceptance.
- 8

9 1.14 PLANS AND SPECIFICATIONS

- 10 A. The plans show diagrammatically the locations of the various lines, ducts, conduits, fixtures,
- 11 and equipment and the method of connecting and controlling them.
- 12
- 13 B. It is not intended to show every connection in detail and all fittings required for a complete
- 14 system.
- 15
- 16 C. The systems shall include but are not limited to the items shown on the plans.
- 17
- 18 D. Exact locations of these items shall be determined by reference to the general plans and
- 19 measurements of the building and in cooperation with other Contractors, and in all cases, shall
- 20 be subject to the approval of the Engineer.
- 21
- 22 E. The Engineer reserves the right to make any reasonable change in the location of any part of
- 23 this work without additional cost to the Owner.
- 24
- 25 F. Contractor, subcontractor, vendors and suppliers are required to waive subrogation against
- 26 Owner and Engineer.
- 27
- 28

29 1.15 UTILITIES, LOCATIONS, AND ELEVATIONS

- 30
- 31 A. Locations and elevations of the various utilities within the scope of this work have been
- 32 obtained from the City and/or other substantially reliable sources and are offered separately
- 33 from the Contract documents, as a general guide only, without guarantees as to accuracy.
- 34
- 35 B. The Contractor shall examine the site, shall verify to his own satisfaction the locations,
- 36 elevations and availability of all utilities and services required, and shall adequately inform
- 37 himself as to their relation to the work; the submission of bids shall be deemed evidence
- 38 thereof.
- 39
- 40 C. The Contractor shall coordinate all services with the Utility Companies during construction,
- 41 coordinate changes made by Utility Companies to the design of project, and coordinate with
- 42 the Owner, Engineer, and Utility the scheduling of any shutdowns or delays that may occur in
- 43 providing service.
- 44
- 45 D. The Contractor shall verify location, conduct all necessary tests, inspections, coordinate with
- 46 Owner's representatives and utilities, and check for existing underground utilities and lines
- 47 before ditching.
- 48
- 49 E. The Contractor shall be responsible for repair of any cut or damaged lines or utilities he
- 50 uncovers. There are lines and utilities not shown on any plans.
- 51
- 52 F. Contractor is responsible for coordination of all existing and new utilities at site. Contractor is
- 53 responsible for protecting and repairing any utilities damaged by installation of pipe. All
- 54 existing and new landscaping/trees to remain and to be protected unless directed otherwise
- 55 by Owner.
- 56

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1 1.16 SUBSTITUTION OF PRODUCTS
2

- 3 A. Substitution of products specified herein will be considered only when a complete list of
4 proposed alternative equipment is submitted to the Engineer in writing, supported by adequate
5 technical and cost data. This includes a complete description of the proposed substitution,
6 drawings, catalog cuts, performance data, test data, or any other data or information
7 necessary for evaluation.
8
- 9 B. All proposed substitutions and data must be received by the Engineer no less than ten working
10 days prior to the schedule date for opening of bids.
11
- 12 C. The Engineer will consider all such submittals and the Engineer will issue an addendum listing
13 items which the Engineer considers acceptable. Only such items as specified or approved as
14 acceptable will be installed on this project.
15
- 16 D. Manufacturers' names are listed herein and on the plans to establish a standard of quality and
17 design. Where a manufacturer's name is mentioned, products of other manufacturers will be
18 acceptable, if in the opinion of the Engineer, the substitute material is of equivalent quality or
19 better than that of the material specified.
20
- 21 E. The Contractor's Bid represents that the bid price is based solely upon the materials and
22 equipment described in the Bid Documents (including addenda, if any) and that he
23 contemplates no substitutions or extras.
24
- 25 F. Requests for substitution are understood to mean that the Contractor:
26 1. Has personally investigated the proposed substitution and determined that it is equal or
27 superior in all respects to that specified.
28 2. Will provide the same guarantee for the substitution that he would for that specified.
29 3. Will, at no cost to the Owner, replace the substitute item with the specified product if the
30 substitute item fails to perform satisfactorily.
31
- 32 G. After Award of the Contract, substitutions will be considered only under one or more of the
33 following circumstances:
34 1. The substitution is required for compliance with subsequent interpretations of code or
35 insurance requirements.
36 2. The specified product is unavailable through no fault of the Contractor.
37 3. The manufacturer refuses to warranty the specified products as required.
38 4. Subsequent information that the specified product is unable to perform properly or to fit
39 in the designated space.
40 5. In the Engineer's sole judgment, the substitution would be in the Owner's best interest.
41
- 42 H. Revisions to the plumbing system shall be under the supervision of the Engineer at a standard
43 hourly rate charged by the Engineer and shall be paid by the Contractor originating the
44 changes.
45

46 1.17 PROTECTION OF EQUIPMENT AND MATERIALS
47

- 48 A. The Contractor shall take such precautions as may be necessary to properly protect his
49 apparatus from damage.
50
- 51 B. This shall include the creation of all required temporary shelters to adequately protect any
52 apparatus above the floor of the construction and the covering of apparatus in the completed
53 building with tarpaulins or other protective covering.
54

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1 C. Failure to comply with the above to the satisfaction of the Owner's inspector will be sufficient
2 cause for the rejection of the equipment in question and its complete replacement by this
3 Contractor.

4
5 D. All apparatus shall be cribbed up from the floor or ground by the Contractor and covered with
6 tarpaulins or other protective covering where necessary or directed.

7
8 1.18 FINAL INSPECTION

9
10 A. It shall be the duty of this Contractor to make a careful inspection trip of the entire project,
11 assuring himself that the work on the project is ready for final acceptance before calling upon
12 the Engineer to make a final inspection.

13
14 B. To avoid delay of final acceptance of the work, the Contractor shall have all necessary bonds,
15 warranties, receipts, affidavits, etc., called for in the various articles of these specifications,
16 prepared and signed in advance, together with a letter of transmittal, listing each paper
17 included, and shall deliver the same to the Engineer at or before the time of said final
18 inspection. The Contractor is cautioned to check over each bond, receipt, etc., before
19 preparing for submission to verify that the terms check with the requirements of the
20 specifications.

21
22 1.19 CUTTING AND PATCHING

23
24 A. All Subcontractors shall notify the General Contractor sufficiently ahead of construction of any
25 floors, walls, ceiling, roof, etc., of any openings that will be required for his work.

26
27 B. He shall see that all sleeves required for his work are set at proper times so as to avoid delay
28 of the job.

29
30 C. All necessary cutting of walls, floors, partitions, ceilings, etc., as required for the proper
31 installation of the work under this Contract shall be done at the Subcontractor's expense in a
32 neat and workmanlike manner, and as approved by the Engineer.

33
34 D. No joists, beams, girders or columns shall be cut by any Contractor without first obtaining
35 written permission of the Engineer.

36
37 E. Patching of openings and/or alterations shall be provided by the General Contractor.

38
39 F. All openings in firewalls and floors, such as thimbles, shall be completely sealed after
40 installation for a completely airtight and watertight installation. Sealing material shall be
41 non-combustible and UL approved. The installed sealing assembly shall not cause the fire
42 rating of the penetrated structure to be decreased.

43
44 G. All openings in exterior walls shall be sealed watertight.

45
46 1.20 IDENTIFICATION

47
48 A. Refer to Section 22 05 54.

49
50 1.21 MANUFACTURER'S INSTRUCTIONS

51
52 A. All equipment and devices shall be installed in accordance with these plans and specifications,
53 manufacturer's instructions and applicable codes.

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- 1 B. Where specifications call for installation of a product to be in accordance with manufacturer's
2 instructions and/or where manufacturer's instructions are required for installation of a product,
3 it shall be the Contractor's responsibility to obtain the necessary applicable manufacturer's
4 instructions and install the product in accordance with the manufacturer's instructions.
5
- 6 C. It shall be the Contractor's responsibility to install all equipment, materials, and devices shown
7 on the plans and as called out in these specifications even if manufacturer's instructions are
8 absolutely unattainable.
9
- 10 1.22 RELATED WORK
- 11
- 12 A. The various specification sections for this division may or may not include related work listings.
13
- 14 B. All related work shall be coordinated and provided by the Contractor regardless whether
15 specifically identified or not.
16
- 17 1.23 ELECTRICAL WIRING AND EQUIPMENT FOR PLUMBING SYSTEMS
18
- 19 A. All wiring, conduit, boxes, equipment (controls, thermostats, relays, contactors, motor starters,
20 heaters, switches) and any other control devices or equipment required to form a complete
21 and properly operating system, shall be the responsibility of this Contractor.
22
- 23 B. The Electrical Contractor shall only provide line voltage (including hook-up) to all plumbing
24 equipment.
25
- 26 C. All controls and devices shall be low voltage unless otherwise noted or shown on the plans.
27 Where line voltage controls or devices are noted, the Contractor shall provide complete wiring
28 diagrams (approved by the Engineer) to the Electrical Contractor prior to final hook-up.
29
- 30 D. The Plumbing and Electrical plans are based on the equipment and devices scheduled as
31 shown on the plans or as called for in the specifications. Should any plumbing equipment or
32 device be changed or approved from those which are shown or noted, all electrical and/or
33 plumbing changes shall be made at the expense of the trade or Contractor initiating the
34 change with no expense to the Owner, Engineer or their representatives.
35
- 36 E. All wiring provided by this Contractor shall be installed in a workmanlike manner using tie
37 wraps, labels, anchors and etc. Loose wiring is not acceptable.
38
- 39 F. All conduit and boxes required in all walls for control purposes (thermostats, switches, etc.)
40 shall be provided by electrical contractor.
41
- 42 G. All conduit required in attic, clear spaces, or on roof shall be by electrical Contractor.
43
- 44 1.24 DEMOLITION AND REMODEL
45
- 46 A. It shall be the responsibility of this Contractor to see that all demolition and remodeling work
47 involving his trade (including but not limited to plumbing piping, condensate lines, plumbing
48 equipment, etc.) is accomplished in a manner and completeness to provide the appearance
49 of new construction work.
50
- 51 B. Abandoned plumbing fixtures shall be removed and disposed of off-site in a legal manner.
52
- 53 C. Any usable equipment and/or structure damaged during demolition and remodel work shall be
54 replaced.
55

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- 1 D. All abandoned and/or otherwise unused piping shall be securely capped using materials of
2 the same composition as the original piping.
3
- 4 E. No exposed piping and/or other materials will be permitted in the finished job.
5
- 6 F. Any abandoned piping which penetrates the slab in an exposed area shall be sealed and
7 securely capped below the slab.
8
- 9 1.25 OPERATION PRIOR TO COMPLETION
- 10
- 11 A. When any piece of plumbing equipment is operable and the Contractor needs to operate the
12 equipment, he may do so providing that he properly supervises the operation.
13
- 14 B. The warranty period shall, however, not commence until such time as the equipment is
15 operated for the beneficial use of the Owner.
16
- 17 C. Regardless of whether or not the equipment has or has not been operated, the Contractor
18 shall properly clean the equipment, install clean filter media, properly adjust and complete all
19 punch list items before final acceptance by the Owner.
20
- 21 D. The date of acceptance and the start of the warranty may not be the same date.
22
- 23 1.26 SAFETY GUARDS
- 24
- 25 A. Contractor shall furnish and install all safety guards required. All belt driven equipment,
26 projecting shafts and other rotating parts shall be enclosed or adequately guarded.
27
- 28 1.27 FLAME SPREAD PROPERTIES OF MATERIALS
- 29
- 30 A. All materials and adhesives used for plumbing and insulation shall conform to NFPA and UL
31 life and flame spread properties of materials.
32
- 33 B. The composite classifications shall not exceed 25 for a flame spread rating and 50 for a smoke
34 developed rating as listed for the basic material, the finishes, adhesives, etc., specified for
35 each system and shall be such when completely assembled.
36
- 37 1.28 ASBESTOS
- 38
- 39 A. No asbestos or asbestos containing materials shall be permitted in this project.
40
- 41 1.29 LEAD MATERIALS
- 42
- 43 A. No lead or lead containing materials shall be allowed in any domestic or potable water supply
44 piping, valves, fixtures, components, equipment or any other item.
45
- 46 1.30 REFRIGERANTS
- 47
- 48 A. Chlorofluorocarbons (CFCs) shall not be allowed in any equipment on this project.
49
- 50 B. Comply with ASHRAE Standards 15 and 34.
51
- 52 1.31 REFRIGERANT RECOVERY AND RECYCLE
- 53
- 54 A. Refrigerants shall not be released to the environment.
55

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1 B. Contractor shall provide recovery and recycle equipment that has been certified by the
2 Electrical Testing Laboratories or Underwriters Laboratories.

3
4 C. Contractor shall also provide properly trained and certified (in accordance with EPA) personnel
5 for refrigerant work during installation, demolition, start-up, servicing, etc.
6

7 1.32 ACCESS CLEARANCE

8
9 A. Proper access to all installed equipment shall be provided. This Contractor shall label all points
10 of access immediately upon installation with a marker pen.

11
12 B. A minimum of 3 feet shall be maintained in front of all access points.

13
14 C. If another trade violates this space, this Contractor shall immediately notify the General
15 Contractor to correct this condition.

16
17 D. When equipment is installed above lay-in ceiling this Contractor shall coordinate with the
18 Ceiling Contractor to provide access without removing part of T-bar ceiling.

19
20 E. No speakers, lights, fire alarm equipment, etc. shall be installed in lay-in ceiling tiles where
21 access is to be gained.
22

23
24 PART 2 PRODUCTS

25
26 A. Not Applicable
27

28
29 PART 3 EXECUTION

30
31 3.1 TESTING

32
33 A. After all plumbing systems have been completed and put into operation, subject each system
34 to an operating test under design conditions to ensure proper sequence and operation
35 throughout the range of operation regardless of the season the Contractor shall test all
36 plumbing equipment.
37

38 B. Perform a smoke test on all sanitary sewers and camera all lines and provide owner with a
39 video tape.

40
41 C. Perform gas piping pressure test to comply with HB 1611 and all required City or governing
42 body tests.
43

44 D. Make adjustments as required to ensure proper functioning of all systems.

45
46 E. Special tests on individual systems are specified under individual sections.
47

48 3.2 AS BUILT DRAWINGS

49
50 A. Upon substantial completion, Contractor shall submit as built drawings showing all deviations
51 between contract drawings and actual installed conditions.
52

53 B. Show location of all valves in gas and water piping. Submit to Owner.
54

55
END OF SECTION

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
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SECTION 22 00 90

PLUMBING SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. This section supplements Division 01 Submittal Procedures and contains additional requirements applicable to Division 22 submittals.

1.2 SECTION INCLUDES

A. This section includes, but is not limited to:
1. Plumbing submittal procedures
2. List of required Division 22 submittals to the engineer
3. This section applies only to the Division 22 specifications. Submittals required by other specification divisions are not included here, even though the same subcontractor may be providing work under other divisions.

1.3 RELATED SECTION

A. Division 01 - Submittal Procedures

1.4 DEFINITIONS

- A. Product Data: Illustrations, standard schedules, performance charts, instructions, and brochures furnished by the contractor, subcontractor, manufacturer, or supplier to illustrate materials or equipment or to illustrate some portion of the work. Provide a summary of scheduled items with all data in schedules.
- B. Shop Drawings: Drawings, diagrams, schedules and other data specifically prepared for the work by the contractor, subcontractor, manufacturer, or supplier to illustrate some portion of the work.
- C. Equipment/Material Submittal Package: A compilation of the product data, shop drawings, and other items as required by the specifications, submitted near the start of the work. Typically, the specifications require the initial submittal package to be submitted within a certain number of days after the work starts.
- D. Quality Assurance Submittal: Items submitted before and during the execution of a particular portion of the work for the purpose of guarding against defects and deficiencies.
- E. Quality Control Submittal: Items submitted at the completion of a particular portion of the work for the purpose of evaluating completed activities and elements of the work for conformance with contract requirements (e.g. start-up reports).
- F. Closeout Submittals: Items submitted at or near the completion of the contract.

1.5 SUBMITTALS

A. The materials, workmanship, design, and arrangement of all work installed under this contract shall be subject to the review of the architect, engineer and owner.

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- 1 B. Manufacturers: Manufacturers submitted shall be as per the acceptable manufacturers listed
2 in each specification section or referenced schedule. For additional manufacturers requiring
3 approval, reference the Substitution of Products article in Section 22 00 10.
4
- 5 C. Required Submittals: Refer to the Submittals article of each individual Division 22 specification
6 section for the required items to be submitted.
7
- 8 D. Contractor's Coordination Submittals: The contractor may require his subcontractors to
9 provide drawings, setting diagrams, and similar information to help coordinate the project, but
10 such data shall remain between the contractor and his subcontractors and will not be reviewed
11 by the engineer.
12
- 13 E. Electronic Submittals: E-mail or other electronic forms of submittals from the contractor are
14 required. The procedures described in this section shall be as follows:
15 1. The contractor shall supply one electronic copy of the submittal.
16 2. The electronic files will either be e-mailed to the architect, or posted to a project
17 management and information exchange web site, depending on the architect's
18 requirements. The architect and contractor can distribute copies of the files as desired.
19 3. The engineer will retain an electronic copy of the submittal and all responses.
20
- 21 F. Coordination Correspondence: The contractor may desire to verify the acceptability of a
22 particular item prior to assembling the initial submittal package. The contractor may send
23 material directly to the engineer for comments and feedback. This communication will be
24 treated as normal coordination correspondence and will not be tracked or documented as a
25 formal submittal. The engineer may or may not respond to such correspondence. If the
26 engineer agrees, in writing, to the use of a particular item, then that same material shall be
27 included in the initial submittal package along with a copy of the correspondence.
28
- 29 G. Unapproved Products: If materials or equipment are installed before being reviewed and
30 approved by the engineer, the contractor shall be liable for the removal and replacement of
31 such unapproved materials and equipment, at no additional expense to the owner.
32 Additionally, if the removal and replacement of unapproved materials or equipment
33 necessitates the removal and replacement of other related materials or equipment, then the
34 contractor shall be liable for the removal and replacement of the related materials and
35 equipment at no additional expense to the owner.
36
- 37 H. Product Data:
38 1. Where the content of manufacturer submittal literature includes data not pertinent to the
39 submittal, clearly indicate which portions of the contents are being submitted for review.
40 Catalogs, pamphlets, or other documents submitted to describe items on which review is
41 being requested shall be specific and identifications in catalog, pamphlets, etc., of items
42 submitted shall be clearly made in a contrasting ink or highlighting. Data of a general
43 nature shall not be acceptable.
44
- 45 I. Shop Drawings:
46 1. Scale and measurements: Make shop drawings accurately to a scale sufficiently large to
47 show all pertinent aspects of the item.
48 2. Electronic shop drawing submittals are required.
49 3. **Shop drawings must include domestic water entry rooms with backflow prevention
50 and all water heater rooms.**
51

52 1.6 QUALITY ASSURANCE / CONTROL SUBMITTALS
53

- 54 A. Quality assurance and quality control submittals may be in the form of documentation, or may
55 be in the form of completed physical work that is offered for review by the engineer, architect,
56 or owner.

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- 1 B. If documentation is the subject, then submit in a manner similar to the initial submittal package.
- 2
- 3 C. If completed physical work is the subject, then the work shall not be concealed, nor shall
- 4 subsequent work be performed, until the engineer's representative has reviewed the work. If
- 5 the work is concealed, or if subsequent work is performed, before the engineer's
- 6 representative has reviewed the work, then the contractor shall be liable for removal and
- 7 replacement at no additional expense to the owner.
- 8
- 9 D. Sequencing:
- 10 1. Within 30 calendar days after the contractor has received the owner's notice to proceed,
- 11 provide the complete submittal package.
- 12 2. After the engineer has reviewed the submittal package, make necessary revisions to the
- 13 submittals as directed by the engineer and resubmit.
- 14 3. After the submittal has been reviewed by the engineer, proceed to purchase materials
- 15 and perform the work.
- 16
- 17 E. Scheduling:
- 18 1. Failure to submit items that meet the requirements of the contract documents in ample
- 19 time for review shall not entitle the contractor to an extension of contract time, and no
- 20 claim for extension by reason of such default shall be allowed. The contractor may be
- 21 held liable for delays so occasioned.
- 22
- 23

24 PART 2 PRODUCTS

- 25
- 26 A. Not applicable
- 27
- 28

29 PART 3 EXECUTION

30

31 3.1 SUBMITTALS

- 32
- 33 A. Make submittals of product data, shop drawings, samples, quality assurance submittals,
- 34 quality control submittals, and other items in accordance with the requirements of this section,
- 35 applicable sections in Division 22, and additional requirements of each individual Division 22
- 36 specification section.
- 37
- 38 B. Grouping of Submittals:
- 39 1. The submittal package shall be coordinated and included in a single submission. Multiple
- 40 submissions are not acceptable except where prior written approval has been obtained
- 41 from the engineer. Partial submittals may be rejected, without being reviewed, as not
- 42 complying with the provisions of the contract.
- 43 2. In the case that multiple submissions are approved, it is the responsibility of the contractor
- 44 to maintain and update a submittal check list. The contractor shall ensure that all
- 45 applicable submittal sections are submitted to the Engineer. If a submittal section is not
- 46 submitted, it will be considered rejected until reviewed by the Engineer.
- 47 3. If submittal sections are submitted as individual submittal files, the submittal sections will
- 48 be grouped and returned as one file with one set of submittal responses.
- 49
- 50 C. Electronic Submittal Organization:
- 51 1. Electronic submittals are to be submitted as a single PDF file. Within the PDF file, each
- 52 section shall be bookmarked.
- 53 2. Provide an electronic submittal cover sheet that lists at least the following:
- 54 a. Project name
- 55 b. Date
- 56 c. Name and address of architect

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- 1 d. Name and address of engineer
- 2 e. Name, address and telephone number of prime contractor
- 3 f. Name, address and telephone number of HVAC contractor
- 4 g. Name, address and telephone number of HVAC supplier
- 5 3. Provide an electronic index sheet listing all items submitted.
- 6 4. The contractor shall call to the attention of the engineer, clouded in the submittal and
- 7 noted after the index sheet, any instance in which the submittals are known to differ from
- 8 the requirements of the contract documents.
- 9 5. Organize all required items by specification section. The material for each specification
- 10 section shall be organized as follows:
- 11 a. Provide an electronic section cover sheet that lists the same information as the
- 12 submittal cover sheet, plus the specification number and title and the name, address
- 13 and telephone number of the vendor or vendor's representative, if applicable.
- 14 b. Refer to the individual Division 22 specification sections for any required
- 15 organization of the submittal material within each submittal section.
- 16 c. Bookmarked sections shall be arranged by specification section number in
- 17 numerical order.
- 18 d. Submit in accordance with these procedures and procedures described in Division
- 19 01 Submittal Procedures.
- 20 e. Submittals not organized as described here may be rejected, without being
- 21 reviewed, as not complying with the provisions of the contract.
- 22
- 23 D. Response to engineer's review:
- 24 1. Review comments:
- 25 a. Review comments of the engineer will either be shown on the returned sets to the
- 26 contractor, or shown on a document attached to the sets. If the comments are on an
- 27 attached document, then the engineer will place a note on the submittal referring to
- 28 the attached comments. In such cases, the engineer's signature will appear only on
- 29 the attached document. If the attached, signed document becomes physically
- 30 separated from the submittal, then the submittal will no longer be considered as
- 31 being a reviewed submittal.
- 32 2. Complete rejection:
- 33 a. If the submittal is not complete or does not meet the requirements of this
- 34 specification section, then the engineer may reject the entire submittal and return
- 35 the submittal without further review or comment. In such cases, the entire submittal
- 36 shall be completely revised and resubmitted. The resubmittal shall be given a new
- 37 submittal number and shall be documented and processed as a separate submittal
- 38 from the original.
- 39 3. Held for completion:
- 40 a. If the submittal is not complete, but is only missing some minor item, the engineer
- 41 may, at the engineer's sole discretion, hold the submittal rather than rejecting and
- 42 returning the submittal. In such cases, the engineer will notify the architect and
- 43 contractor that the submittal is being held for completion. The contractor will be given
- 44 a predetermined amount of time to provide the missing item. Upon receipt of the
- 45 missing item, the engineer will insert the missing item into the submittal package
- 46 and proceed with the review process.
- 47 4. Partial rejection:
- 48 a. The engineer may reject only certain portions of the submittal. In such cases, only
- 49 those rejected portions or items need to be revised and resubmitted.

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 - 11
 - 12
- 5. Provide as corrected:
 - a. The engineer may note a required change to a submitted item, but may not consider the change serious enough to require a resubmittal. In such cases, the engineer will note that the item is to be provided as noted or corrected. In such cases, the contractor may proceed to provide the item. However, if subsequent observations reveal that the noted change was not made, then the contractor shall be liable for removal and replacement of the item at no additional cost to the owner.
 - 6. Reviewed without comment:
 - a. The contractor may proceed to provide all materials and equipment.
 - E. Close-out Submittals:
 - 1. Provide close-out submittals in accordance with the requirements of Division 1.

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Section	Submit on the following	1	2	3	4	Arch Sub #
22 05 24	Valves					
	Full port					
	Bronzed body					
	Ball valves					
22 05 30	Pipe and Pipe Fittings					
	Hangers					
	Dissimilar Metals Union					
	Unions					
	Escutcheons					
	Sleeves					
	Hanger rods					
	Concrete anchors					
	Beam Clamps					
	Fire Penetration Products					
22 05 54	Plumbing Identification					
	Valve tags and chains					
	Valve chart					
	Piping markers					
	18 gauge copper wire for underground gas piping					
	Equipment labels					
	Nametag fasteners					
	Underground warning tape					
22 07 20	Piping Insulation					
	Closed cell only in concrete masonry walls					
	2" wrap for concealed roof drain piping					
	2" wrap at roof drain deck pan					
	2" rigid on exposed roof drains or					
	2" wrap with PVC jacketing on exposed roof drains					
	Domestic hot and cold water pipe insulation					
	(1" for hot water and 1" for lines in exterior walls)					
	Flange, fitting, valve Insulation					
	Insulation metal shield					
	Sealant, adhesive, finish					
22 16 01	Natural Gas Piping and Appurtenances					
	Schedule 40 black steel pipe and fittings					
	Gas regulators					
	Paint for roof and up wall installations					
	Cut off valves, unions, inspection ports					

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Section	Submit on the following	1	2	3	4	Arch Sub #
	Polyethylene gas piping below grade					
	Roof supports					
1 - Reviewed						
2 - Furnish as corrected in comments, resubmit not required						
3 - Revise and Resubmit based on comments						
4 - Rejected based on comments						

END OF SECTION

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SECTION 22 05 24

VALVES - GENERAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

- A. General requirements for valves

1.3 RELATED SECTIONS

- A. Section 22 00 10 - Basic Plumbing Requirements
- B. Section 22 05 30 - Pipe and Pipe Fittings - General
- C. Section 22 16 01 - Natural Gas Piping and Appurtenances

1.4 REFERENCES

- A. ASTM 763 - Standard Specification for Copper Alloy Sand Castings for Valve Applications
- B. ASTM 61 - Standard Specification For Steam or Valve Bronze Castings
- C. ASTM C27450 - Standard Specification for Brass Rod, Bar & Shapes
- D. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges & Pipe Fittings
- E. ASTM A105 - Standard Specification for Carbon Steel Forgings for Piping Applications
- F. ASTM - American Society of Testing Materials
- G. ASTM A216 - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High Temperature Service
- H. ASTM B813-00e1 - Standard Specification for Liquid & Paste Fluxes for Soldering of Copper & Copper Alloy Tube
- I. ASTM B828-02 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings
- J. ASTM B88-02 - Standard Specification for Seamless Copper Water Tube
- K. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings
- L. CSA - Canadian Standards Association
- M. PDI - Plumbing & Drainage Institute

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1 1.5 QUALITY ASSURANCE

- 2
3 A. Manufacturer to stamp valve to show that shell and seat tests have been successfully
4 completed.
5
6 B. To assure uniformity and compatibility, all grooved end valves and adjoining couplings shall
7 be supplied by Victaulic or engineer approved equal.
8

9 1.6 SUBMITTALS

- 10
11 A. Provide submittal data on all items specified in this section in accordance with Specification
12 Section 22 00 10, General Conditions, and Division 01.
13
14

15 PART 2 PRODUCTS

16
17 2.1 MATERIAL SPECIFICATIONS

- 18
19 A. Bronze - 150 psi maximum: ASTM B62
20
21 B. Bronze - 300 psi maximum: ASTM B61
22
23 C. Cast Iron: ASTM A126, Class B
24
25 D. Cast Carbon Steel: ASTM A216, Grade WCB
26
27 E. Forged Carbon Steel: ASTM A105, Grade II
28
29 F. Brass - Lead free, dezincification resistant arsenical brass, 125 psi maximum, ASTM 763 or
30 B283.
31

32 2.2 CONSTRUCTION

- 33
34 A. Provide valves designed for repacking under pressure when fully opened.
35
36 B. Equip with packing suitable for intended service.
37
38 C. Furnish with gland followers.
39
40 D. Provide valves rated greater than the design temperature and pressure for the intended
41 system.
42
43 E. All domestic cold water and hot water valves 2" and less shall be full port ball valves with
44 stainless steel ball.
45
46 F. All domestic cold water and hot water valves 2-1/2" and larger to gate valves.
47

48 2.3 MANUFACTURERS

- 49
50 A. Apollo
51
52 B. Crane
53
54 C. Grinnell
55
56 D. Jenkins

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- 1 E. Jomar, T-100NGDZ
- 2
- 3 F. Kennedy
- 4
- 5 G. Milwaukee Valve Company
- 6
- 7 H. Nibco
- 8
- 9 I. Stockham
- 10
- 11 J. Walworth
- 12
- 13 K. Watts
- 14
- 15 L. Hammond
- 16
- 17 M. Kitz
- 18
- 19 N. Victaulic
- 20

21
22 **PART 3 EXECUTION**

23
24 **3.1 INSTALLATION**

- 25
- 26 A. Install valves and stops in accessible locations.
- 27
- 28 B. Provide where shown or as required to make system complete and readily maintained.
- 29
- 30 C. Provide access doors for all inaccessible valves.
- 31
- 32 D. Provide as built drawings locating all valves in gas and water lines.
- 33
- 34 E. Pipe ends shall be clean and free from indentations, projections, and roll marks in the area
- 35 from pipe end to groove.
- 36
- 37 F. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended
- 38 service as specified.
- 39
- 40 G. See the latest copy of the manufacturer's Field Assembly and Installation Instruction Pocket
- 41 Handbook (I-100).
- 42

43 **3.2 APPLICATION**

- 44
- 45 A. Use grooved couplings and fittings on applicable systems in accordance with manufacturer's
- 46 recommendations.
- 47
- 48 B. Unions are not required in installations using grooved mechanical couplings. (The couplings
- 49 shall serve as unions.)
- 50
- 51 C. Grooved joint products may be installed in all locations as permitted by the engineer and local
- 52 code.
- 53
- 54 D. Use grooved end valves where possible. Install grooved joint flange adapters where flanged
- 55 or lug type valves are necessary.
- 56

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1 E. The coupling manufacturer’s representative shall periodically visit the jobsite and review
2 installation. Contractor shall remove and replace any joints deemed improperly installed.
3

4 3.3 TRAINING

5
6 A. A factory trained field representative (direct employee) shall provide on-site training for
7 contractor’s field personnel in the proper use of grooving tools, application of groove, and
8 installation of grooved piping products.
9

10 END OF SECTION

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SECTION 22 05 30

PIPE AND PIPE FITTINGS – GENERAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

- A. Pipe
- B. Pipe fittings

1.3 RELATED SECTIONS

- A. Section 22 00 10 - Basic Plumbing Requirements
- B. Section 22 05 24 - Valves - General
- C. Section 22 07 20 - Piping Insulation
- D. Section 22 16 01 - Natural Gas Piping and Appurtenances

1.4 REFERENCES

ASME	American Society of Mechanical Engineers
ASTM C564-97	Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM D2665-02a	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM E84-01	Standard Test Method for Surface Burning Characteristics of Building Materials
UL	Underwriters Laboratory
NFPA 90 A & B	Installation of Air Conditioning & Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems
CISPI-310	Cast Iron Soil Pipe Institute
CSA	Canadian Standards Association

1.5 QUALITY ASSURANCE

- A. Valves:
 - 1. All valves to be from a single manufacturer.
- B. The welder, employed on this project, shall have passed qualification tests as prescribed by the National Pipe Welding Bureau, or other reputable testing laboratory using qualification procedures as recommended by the ASME Boiler Construction Code or the American Welding Society Standards.
- C. 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.

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- 1 1.6 SUBMITTALS
2
3 A. Provide submittal data on all items specified in this section in accordance with Specification
4 Section 22 00 10, General Conditions, and Division 01.
5
6 B. Submit product data indicating dimensions, general assembly and use.
7
8 C. Grooved joint couplings and fittings shall be shown on drawings and product submittals and
9 shall be specifically identified with the applicable style or series designation.
10

11
12 PART 2 PRODUCTS

- 13
14 2.1 PIPE AND FITTINGS
15
16 A. The type of pipe and fittings necessary for each system is specified in the section on that
17 system.
18
19 B. Roll groove stainless steel pipe with grooving tools specifically designed for stainless steel
20 pipe. Use Victaulic RX roll sets specifically designed for grooving schedule 5 or 10 stainless
21 steel pipe.
22
23 C. Copper Tube: ASTM B-88 (Type K, L, M, or DWV) Roll grooved only in accordance with
24 manufacturer's current listed standards and copper tube dimensions
25

- 26 2.2 DISSIMILAR MATERIALS
27
28 A. Use approved adapters such as Di-Electric Unions manufactured for making piping
29 connections between dissimilar materials such as copper and brass or copper and steel.
30

- 31 2.3 ESCUTCHEONS
32
33 A. Usage:
34 1. All exposed lines passing through floors, walls and ceilings.
35
36 B. Material:
37 1. Chrome plated steel
38
39 C. Flange size:
40 1. As necessary to cover penetrated openings.
41
42 D. Plate size:
43 1. As necessary to fit pipe or insulation and securely lock in place.
44
45 E. Manufacturer/Model:
46 1. Engineered Brass Company, Type CF
47

- 48 2.4 SLEEVES
49
50 A. Application:
51 1. Provide sleeves for all pipes and conduits which pass through or enter a concrete slab,
52 masonry wall/concrete wall, sheetrock wall (fire rated or not fire rated), roof or other
53 portion of the building structure.
54

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- 1 B. Above Grade and/or dry locations:
2 1. Material:
3 a. 20 or 22 gauge galvanized steel.
4 2. Size:
5 a. As necessary to allow free passage of the insulated pipe.
6
7 C. Below Grade and/or moist locations:
8 1. Material:
9 a. ASTM D-2665 Schedule 40 PVC. When PVC not allowed by code, use schedule 40
10 galvanized steel.
11 b. Return Air Plenum:
12 (1) Schedule 40 galvanized steel.
13
14 D. Passing through fire-rated enclosures:
15 1. Material:
16 a. Galvanized or black steel pipe.
17 b. Non-combustible.
18 c. PVC will not be allowed.
19
20 E. Penetration Seal: (All Sleeved Penetration Locations- fire rated or non-fire rated)
21 1. Seal penetration with 3M Fire Barrier Sealant CP 25WB+ or one-component ceramic
22 fiber-based putty fill, void or cavity material, UL rated material classified for use in
23 through-penetration firestop systems nos. 124, 125, 150 and 151.
24 2. Flame Spread/Smoke Contribution:
25 a. 0/0 in accordance with ASTM E-84.
26

27 2.5 VALVES, UNIONS, STOP COCKS, ETC.
28

- 29 A. Applications:
30 1. Ball Valves:
31 a. Provide accessible valves at each group of plumbing fixtures and at each piece of
32 equipment on all piping systems for isolation of fixtures and equipment. All valves
33 shall be full port valves.
34
35 B. All Other Valves, Unions, Stop Cocks, Etc.:
36 1. Provide at each group of plumbing fixtures and at each individual fixture, at each piece
37 of equipment, at all inlet and outlet connections for hot and cold water and gas.
38 2. Provide Di-Electric Unions at connection of dissimilar pipe materials to prevent
39 electrolysis.
40
41 C. Type:
42 1. Suitable for 125 lbs. working pressure.
43
44 D. Flange Adapters: For use with grooved end pipe and fittings, for mating to ANSI Class 125
45 flanged components. Basis of design Victaulic Style 441 or engineer approved equal.
46
47 E. ½" (DN15) through 4" (DN100) sizes, IPS to copper-tubing size dielectric transition fitting.
48 Fittings shall be a copper-silicon casting conforming to UNS C87850, and UL classified in
49 accordance with ANSI / NSF-61 for potable water service. Fittings shall have threaded ends,
50 grooved ends, or a combination. Basis of design Victaulic Style 647 or engineer approved
51 equal.
52

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- 1 2.6 PIPE SUPPORTS
2
3 A. Hangers:
4 1. 2" and Smaller Piping:
5 a. May be split cast ring type with fastening device in walls and chases.
6 2. Copper Piping:
7 a. Copper plated ferrous hangers.
8 3. All Other Above Ceiling Locations:
9 a. Adjustable clevis type. Hangers to accommodate circumference of pipe and saddles.
10
11 B. Hanger Rods:
12 1. Type:
13 a. Minimum 3/8 inch diameter with machine threads.
14
15 C. Minimum Steel Hanger Rod Diameter for Individually Suspended Horizontal Pipes:
16 1. 2" and smaller diameter pipe:
17 a. 3/8"
18 2. 2-1/2" to 3 - 1/2" diameter pipe:
19 a. 1/2"
20 3. 4" to 5" diameter pipe:
21 a. 5/8"
22 4. 6" diameter pipe or larger:
23 a. 3/4"
24
25 D. Hanger Manufacturers:
26 1. Anvil
27 2. Elcen
28 3. ERICO
29 4. F&S Manufacturing
30 5. Fee & Mason
31 6. PHD
32
33 E. In wall pipe supports:
34 1. Metal strut, manufactured pipe clamps
35
36 F. In wall pipe support manufacturer:
37 1. Holdrite or Equivalent
38
39

40 PART 3 EXECUTION

- 41
42 3.1 PIPE INSTALLATION
43
44 A. Install piping in a neat and workmanlike manner.
45
46 B. Install each of the piping systems to provide for expansion and contraction.
47
48 C. Solder all joints when the system is not under strain.
49
50 D. Expansion Offsets:
51 1. Copper Piping:
52 a. Use developed length Copper Tube Handbook 411-R as published by Copper
53 Development Association, Inc.
54 2. Steel Piping:
55 a. Use developed per Carrier System Design Manual, Part 3 Piping Design.
56

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- 1 E. Furnish necessary spring pieces and offsets as required.
2
3 F. Conceal all of the piping systems in chases, above ceilings, in walls and in finished areas.
4
5 G. Run Exposed piping only in machinery spaces and unfinished areas as specified or as shown
6 on the plans.
7
8 H. Install all necessary fittings and offsets to hold the piping close to walls and ceilings.
9
10 I. Where these lines run exposed, obtain a clearance from the Engineer in writing before making
11 the installation.
12
13 J. Install piping in the most advantageous manner possible with respect to headroom, valve
14 access, openings, equipment clearances, and clearances for other work.
15
16 K. Give particular attention to piping in the vicinity of equipment.
17
18 L. Preserve the maximum access to various equipment parts for maintenance.
19
20 M. Do not cut or weaken any structural member.
21
22 N. Cut all pipes accurately to measurement determined at the site.
23
24 O. After cutting pipe, ream it to remove burrs.
25
26 P. Install piping neatly, free from unnecessary traps and pockets. Work into place without
27 springing or forcing.
28
29 Q. Use fittings to make all changes in direction.
30
31 R. Field bending and mitering are prohibited.
32
33 S. Make all connections to equipment using flanged joints or unions.
34
35 T. Make reducing connections with reducing fittings only.
36
37 U. Do not allow piping to pass through or over designated electrical rooms.
38
39 V. Compression fittings are not allowed.
40
41 3.2 VALVES, UNIONS, STOP COCKS, ETC.
42
43 A. Locate all valves so that their bonnets may be easily removed.
44
45 B. Move all flange valves shown in horizontal positions so that valve stem is inclined one bolt
46 hole above the horizontal position.
47
48 C. Make-up all screwed pattern valves placed in horizontal lines so that their valve stem is
49 inclined at an angle of 30 degrees above the horizontal position.
50
51 D. All valve stems must be true and straight at the time the system is tested for final acceptance.
52
53 E. Pack all valves and leave perfectly tight at the completion of the work.
54
55 F. Provide access doors as required for these valves.
56

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1 G. Furnish locations of all access doors to the Engineer.
2

3 3.3 PIPING JOINTS
4

5 A. Screwed Pipe Joints:

- 6 1. Provide full cut pipe threads.
7 2. Assemble joints with an approved compound applied to only the male threads.
8 3. Leave a maximum of three pipe threads exposed where the joint is assembled.
9

10 B. Welded Pipe Joints:

- 11 1. Fuse weld by using a metallic arc welding process.
12 2. Conform to the current recommendations of the American Welding Society for all welding
13 operations.
14

15 C. Mechanical Coupling Joints for Copper Systems:

- 16 1. Grooved-End-Tube Couplings: Ductile iron conforming to ASTM A-536, Grade 65-45-12,
17 coated with copper colored alkyd enamel. Housings cast with offsetting, angle-pattern
18 bolt pads to provide rigidity. Coupling Gaskets: Grade "P" Fluoroelastomer compound
19 with red and blue color code designed for operating temperatures from 0 deg F to +180
20 deg F.
21 a. Center-leg gasket with pipe stop to ensure proper groove engagement, alignment,
22 and pipe insertion depth.
23 b. Installation Ready direct-push-installation
24 c. Reference shall always be made to the latest published Victaulic Selection Guide
25 for Gaskets for proper gasket selection for the intended service.
26 d. Basis of design Victaulic Style 607 or engineer approved equal
27 2. Fittings: Fittings shall be manufactured to copper tubing sizes, with grooves designed to
28 accept grooved end couplings of the same manufacturer. Fittings shall be wrought
29 copper, conforming to ASTM B-75 alloy C12200 or ASTM B-152 alloy C11000 and ANSI
30 B16.22, or bronze sand-casting ANSI B16.18 and UNS-C89836. Victaulic Copper
31 Connection Fittings.
32

33 D. Mechanical Coupling Joints for Stainless Systems:

- 34 1. Grooved-End Couplings: Hot dip galvanized or blue enamel-coated ductile iron
35 conforming to ASTM A-536, grade 65-45-12 housing. Coupling Gaskets: Gasket shall be
36 Grade "P" Fluoroelastomer compound with double blue color code designed for operating
37 temperatures from 0 deg F to +180 deg F.
38 a. Center-leg gasket with pipe stop to ensure proper groove engagement, alignment,
39 and pipe insertion depth.
40 b. Installation Ready direct-push-installation
41 c. Reference shall always be made to the latest published Victaulic Selection Guide
42 for Gaskets for proper gasket selection for the intended service.
43 d. Basis of design Victaulic Style 807 or engineer approved equal
44 2. Grooved End Fittings: Fittings shall be manufactured of stainless-steel conforming to
45 ASTM A-403, WPW, WPW/S9, or CR/S9, or shall be fabricated from stainless steel pipe
46 conforming to ASTM A312, with factory grooved ends. Fittings shall be type 304/304L or
47 316/316L stainless steel.
48

49 E. Solder Joints:

- 50 1. Assemble with square cut pipe using a pipe cutter.
51 2. Hacksaw-cut pipe ends will not be acceptable.
52 3. Ream open pipe end to full size.
53 4. Burnish both the pipe and fitting absolutely clean.
54 5. Apply brazing flux to both the pipe and the fittings.
55 6. The use of corrosive acid flux will not be permitted.
56 7. Charge the pipe and fittings with nitrogen gas during the brazing.

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- 1 F. Hubless Cast Iron Soil Pipe Joints:
 - 2 1. Make with an approved neoprene gasket and stainless steel retaining sleeve.
 - 3 2. Mark no-hub gaskets with the manufacturer's name, ASTM C 564, the word "No-Hub",
 - 4 nominal diameter and the CI symbol of the Cast Iron Soil Institute indicating it meets the
 - 5 standard.
 - 6 3. Mark stainless steel couplings for no-hub "All Stainless", name of manufacturer, words
 - 7 "No-Hub", nominal diameter and the CI symbol indicating it conforms to CISPI Standard
 - 8 310.
 - 9 4. Install the hubless cast iron soil pipe systems in accordance with CISPI Pamphlet
 - 10 100 - Installation Suggestions for CI No-Hub Pipe and Fittings.
 - 11 5. Provide identifying markers for stainless steel couplings and neoprene gaskets to indicate
 - 12 compliance with CISPI-310.
 - 13
- 14 G. Positive-Seal One Piece Elastomeric Compression-Type Gasket:
 - 15 1. May be used for joining hub and spigot cast iron soil pipe as an alternate for lead or
 - 16 oakum joints or for drainage and waste system above and below ground.
 - 17 2. Form the joint by inserting an approved gasket in the hub.
 - 18 3. Lubricate the inside of the gasket and push the spigot end of the pipe into the gasket until
 - 19 seated, thus effecting a positive seal.
 - 20 4. Use neoprene compression gaskets for cast iron soil pipe, marked as such, with ASTM
 - 21 C564 and the CI symbol of Cast Iron Soil Pipe Institute to indicate the gasket meets the
 - 22 standard.
 - 23
- 24 H. PVC Pipe Joints:
 - 25 1. May be solvent cemented using the proper cement recommended for the particular
 - 26 materials.
 - 27 2. Cut all pipe square and clean both pipe and fittings of all soil, dirt, oil and grease.
 - 28 3. Make solvent joints in accordance with the applicable ASTM Standards.
 - 29 4. Allow joints to dry before testing.
 - 30 5. If any leak occurs during the water test, then replace the defective joint.
 - 31 6. Comply with requirements of the NSF Standard 14 for all solvent cements and primers
 - 32 and label to identify the laboratory certifying compliance for the particular cement and
 - 33 primer being used.
 - 34 7. Plastic pipe and fittings for sewer and water pressure lines may also be joined by use of
 - 35 elastomeric (O-ring gasket) joints when the respective standards for the materials so
 - 36 specify. No-Hub fittings are not allowed on PVC sanitary sewer and storm drain piping
 - 37 under slab or underground.
 - 38 8. Do not use pipes with cracked bells.
 - 39 **9. PVC pipe and pipe fittings are not allowed in any return air plenum serving**
 - 40 **mechanical systems. Use cast iron piping above slab for these installations.**
 - 41
- 42 I. PVC/CPVC Groove Joints:
 - 43 1. Victaulic PGS-300 CPVC Piping system may be used on water and chemical services
 - 44 where IPS size Schedule 80 CPVC pipe is approved for use. Pipe and fittings shall be
 - 45 cut grooved to Victaulic's PGS-300 groove specification. Schedule 80 CPVC pipe shall
 - 46 meet the requirements of ASTM F441 and ASTM D1784 - minimum cell classification
 - 47 24447 Pipe.
 - 48 2. Sizes 2" through 12", as manufactured by Victaulic Company; consisting of two ductile
 - 49 iron housings conforming to ASTM A 536, Grade 65-45-12 cast with housing keys to join
 - 50 Victaulic PGS-300 grooved components, via Installation Ready direct-push-installation.
 - 51 Couplings shall be provided with zinc-electroplated steel bolts and nuts conforming to
 - 52 ASTM A449 and ASTM A563/A563M. Grade-P to suit the intended service, conforming
 - 53 to ASTM D-2000 (Gaskets used on potable water systems shall be UL classified in
 - 54 accordance with ANSI/NSF-61 for potable water service.) Victaulic Styles 356, 357, 358
 - 55 rated to working pressure of Schedule 80 CPVC pipe.
 - 56

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- 1 J. Stainless Steel Press
2 1. Vic-Press 304™: ASTM A-312 stainless steel housings with ASTM A-276 and A-312
3 outlets and austenitic stainless-steel plain or grooved ends, type 304, complete with
4 synthetic rubber Grade "H" (HNBR) seals rated for applicable services to +210 Deg F
5 [+98 Deg C]; Grade "E" EPDM for applicable services to +250 Deg F [+120 Deg C]; or
6 Grade "O" Fluoroelastomer for applicable services to +300 Deg F [+149 Deg C]. System
7 shall be rated to 500 psi (3447 kPa) unless noted otherwise.
8

9 3.4 SLEEVES

- 10 A. Above Grade and/or Dry Locations:
11 1. Walls:
12 a. Mount flush on both sides.
13 2. Floors:
14 a. Mount 2 inches above finished floor in pipe chases.
15
16 B. Below Grade and/or Moist Locations:
17 1. Install suitable flange in the center of wall or floor to form a waterproof passage.
18 2. Fill the void space around the pipe with jute twine or Oakum caulk or an asphalt based
19 compound to insure a waterproof penetration.
20
21 C. Passing Through Fire-Rated Enclosure:
22 1. Fill the void space around the pipe in accordance with NFPA requirements.
23 2. Do not allow the sleeve installation to lower the fire rating of the assembly.
24
25

26 3.5 SECURING AND SUPPORTING OF PIPE

- 27 A. Support all pipe from the building structure by means of approved hangers and supports while
28 maintaining required grade and pitch, preventing vibration and providing for expansion and
29 contraction.
30
31 B. Secure all hangers to approved inserts wherever possible.
32
33 C. Set hanger inserts in place when the concrete is poured.
34
35 D. If Joists Are Used for Attachment:
36 1. 2" diameter or smaller:
37 a. May be attached to the bottom of joists.
38 2. Greater than 2" diameter:
39 a. Must be attached to the top cord of the joists.
40 3. Do not support any piping and trapeze hangers from joist bridging on roof and floor deck.
41
42 E. If Structural Steel Framing Is Used for Attachment:
43 1. Use approved beam clamps.
44 2. Where required, install channels to span between framing members.
45 3. Do not attach hangers to the roof deck or cross bracing.
46
47 F. Hanger Spacing:
48 1. Schedule 40 PVC Piping:
49 a. All Sizes:
50 (1) 4'-0"
51 2. Ferrous (Schedule 40) Piping:
52 a. 1/2" diameter pipe:
53 (1) 6'-0" or less
54 b. 3/4" diameter pipe:
55 (1) 8'-0" or less
56

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- 1 c. 1-1/4" diameter pipe:
2 (1) 10'-0" or less
3 d. Vertical:
4 (1) Every Floor Level Minimum
5 3. Copper (Water Tube) Piping:
6 a. Smaller Than 1 1/4":
7 (1) 6'-0"
8 b. 1 1/2" and Larger:
9 (1) 10'-0"
10 c. Vertical:
11 (1) 10'-0"
12 4. Cast Iron Piping:
13 a. All pipe sizes:
14 (1) One hanger per length of pipe and not exceeding 5'-0" O.C.
15 b. Vertical:
16 (1) Every Floor Level Minimum
17
18 G. Vertical Lines:
19 1. Adequately support at their bases, either by a suitable hanger placed in the horizontal
20 line near the riser, or by a base fitting set on a pedestal or foundation.
21 2. Support from each floor slab by means of an approved clamp-type support which bears
22 on the slab or beam.
23
24 H. Change of Direction:
25 1. Install supports within two feet of change of direction.
26 2. Brackets of approved type may be used along the walls.
27 3. Install hangers within 2 feet of each change in vertical or horizontal direction, pipe tees
28 and on each side of valves, strainers, etc.
29 4. Multiple horizontal pipes, smaller than 12" diameter pipe, may be supported on trapeze
30 hangers. Space trapeze hangers in accordance with the schedule for pipe spacing based
31 upon the smallest size pipe.
32 5. Properly size the trapeze members for the piping load they are to support. The number
33 of pipes on the trapeze must be approved by the Engineer to prevent overloading of the
34 building structure.
35 6. Where pipes are insulated, oversize the hanger accordingly to accommodate the outside
36 diameter of the insulation. Provide half-round 16 gauge galvanized steel shields, not less
37 than 12" long and rolled to fit the insulation diameter, between the insulation and the
38 hanger.
39 7. When pipe is guided at top and bottom, cover the entire pipe circumference with metal
40 shields.
41 8. Adhere metal shield to the insulation so that the metal will not slide with respect to the
42 insulation.
43 9. Wood struts shall not be used to support piping in walls.
44
45 3.6 EXCAVATION AND BACKFILLING
46
47 A. Excavation:
48 1. Call utility companies before digging.
49 2. Call Notifications Center before digging.
50 3. Excavate trenches for underground piping to the required depths with bell holes being
51 provided as necessary to insure uniform bearing. Dig all bell holes after the trench has
52 been graded.
53 4. Refill excavation below the required grade of piping with fine granular material to the pipe
54 grade.
55 5. Where rock is encountered, excavate to a grade 3 inches below the lowermost part of
56 the pipe and refill with fine granular materials to the pipe grade.

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- 1 6. Sheath, brace, pump or bail the trenches as required to protect workmen and structures
- 2 and to permit execution of the work. A trench greater than 5 feet deep will not be permitted
- 3 unless the sides are cutback at 45 degrees to 5 feet or less. If this cannot be
- 4 accomplished, hire a Registered Engineer to design shoring.
- 5 7. Install all underground piping below the frost line and in no case less than 18 inches
- 6 below the surface.
- 7

- 8 B. Pea Gravel Embedment
- 9 1. Refer to Specification Sections 22 13 17 and 22 14 01 for Pea Gravel Embedment for
- 10 schedule 40 PVC piping below slab.
- 11

12 3.7 EQUIPMENT PLUMBING CONNECTIONS

- 14 A. Make all final connections to all pieces of equipment which require natural gas, water, drain,
- 15 waste or vent connections.
- 16
- 17 B. Provide all required shut-off cocks, valves, drain valves and traps.
- 18

19 3.8 TESTING AND INSPECTION

- 21 A. Perform all tests as specified in Division 22 or as required by the Engineer or by the Local,
- 22 Federal, and State Bureaus having jurisdiction and under their supervision during the progress
- 23 and upon completion of work.
- 24
- 25 B. Include costs of all required tests in your bid.
- 26
- 27 C. Provide all apparatus, temporary pipeline and all other requirements necessary for such tests.
- 28
- 29 D. Take all due precautions to prevent damage to the building or its contents incurred by such
- 30 tests as the Contractor will be required to repay and make good any damage so caused at his
- 31 own expense.
- 32
- 33 E. Immediately repair any leaks, defects or deficiencies discovered as a result of the tests.
- 34 Repeat until test requirements are in full compliance.
- 35
- 36 F. The coupling manufacturer’s representative shall periodically visit the jobsite and review
- 37 installation. Contractor shall remove and replace any joints deemed improperly installed.
- 38

39 3.9 IDENTIFICATION OF PIPING AND EQUIPMENT

- 41 A. Mark all piping to show the service and direction of flow.
- 42
- 43 B. Place markers at each branch of tees, at equipment connections, and change of direction and
- 44 at 20 foot intervals. Minimum of one (1) marker in each room.
- 45
- 46 C. Install valve tags on all valves.
- 47
- 48 D. Frame under glass cover and hang a type written list including the valve number, type of
- 49 service, and location of each valve in the boiler mechanical room.
- 50
- 51 E. Mark all valve numbers corresponding to this system of identification on the as-built drawings
- 52 which will be delivered to the Owner upon completion of the work.
- 53
- 54

END OF SECTION

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
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SECTION 22 05 54

PLUMBING IDENTIFICATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

- A. Identification required for plumbing systems.
- B. Code required identification not shown on plans nor specified herein shall be provided.

1.3 RELATED SECTIONS

- A. Section 22 00 10 - Basic Plumbing Requirements
- B. Section 22 05 30 - Pipe and Pipe Fittings - General

1.4 SUBMITTALS

- A. Provide submittal data on all items specified in this section in accordance with Specification Section 22 00 10, General Conditions, and Division 01.
- B. Submit wording of nameplates with submittals.
- C. Submit list of all products incorporated in this section.

1.5 REFERENCES

- A. Comply with ANSI A13.1
- B. USAS Code B31.8
- C. NTSB-PSS-73-1
- D. AGA
- E. API

1.6 DESCRIPTION OF WORK

- A. Provide signs for the following equipment identification:
 - 1. Water Heaters
 - 2. Piping
 - 3. Pumps
 - 4. Starters
 - 5. Valves

PART 2 PRODUCTS

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
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- 1 2.1 MANUFACTURERS
2
3 A. Seton
4
5 B. Brady
6
7 C. Marking Services, Inc.
8
9 2.2 EQUIPMENT LABELS
10
11 A. Type:
12 1. Engraving-Stock, melamine plastic laminate, 3 layer.
13 a. Thickness:
14 (1) Less than 25 square inches: 1/16 inch
15 (2) 25 square inches or more: 1/8 inch
16
17 B. Color:
18 1. Black
19
20 C. Conform to FS L-P-287
21
22 2.3 LETTERING
23
24 A. Style:
25 1. Engraved standard print, unless otherwise indicated.
26
27 B. Size:
28 1. 3/16 inch to 1/4 inch
29
30 C. Color:
31 1. White letters, black background
32
33 2.4 SIGN INFORMATION
34
35 A. Plumbing Equipment:
36 1. Unit mark from Drawings/Owner
37 2. Voltage - Phase
38 3. Manufacturer and Model Number
39
40 2.5 NAMEPLATE FASTENERS
41
42 A. Securely attach nameplates to equipment with non-corroding stainless steel screws.
43
44 B. Non-corroding pop rivets are acceptable.
45
46 C. Stick-ons or adhesives will not be allowed.
47
48 2.6 PIPING AND CONTROL DIAGRAM SIGNS
49
50 A. Material:
51 1. 1/4 inch acrylic cover and backing screwed together with brass screw/bolts.
52 2. Size:
53 a. Minimum:
54 (1) 12" x 17"
55 b. Maximum:
56 (1) 24" x 36"

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- 1 B. Provide a diagram in each mechanical room similar to the diagrams shown on the plans,
2 and/or as required for the area served.
3
- 4 C. Provide pipe markers with the following features.
5 1. Letters from 1/2" to 3-1/2":
6 a. Size letters to afford readability from the appropriate viewing position.
7 2. Repeated and reversed words for viewing from 360° around pipe.
8 3. Self-clinging, coiled markers that snap into place around pipe and do not require any
9 other securement.
10 4. Integral directional arrows.
11
- 12 D. Letters on Field:
13 1. Identify the specific material conveyed, e.g., "Domestic Cold Water", "Domestic Hot
14 Water", etc.
15
- 16 E. Model:
17 1. Less than 3/4":
18 a. Tags, same as Paragraph. Piping System Devices, color codes for hazard.
19 2. 3/4" up to 6":
20 a. Seton Setmark SNA snap-on.
21 3. Over 6":
22 a. Seton Setmark STR strap-on, with stainless steel spring straps.
23 4. Use Seton Ultra-Mark for outdoor use.
24
- 25 F. Piping System Devices (Valves, Thermometers, Pressure Gages, etc., and Pipe Less Than
26 3/4"):
27 1. Identify with the following:
28 a. Tags:
29 (1) Not less than 1-1/2 inch brass or aluminum tags, round, square, or octagonal.
30 b. Stamp tags with minimum 1/2" high descriptive characters, 1/2" high numbers with
31 black enamel-filled indentations.
32
- 33 G. Attachment:
34 1. Stainless steel or solid brass jack chain; Seton JA16, or stainless steel or brass "S" hooks
35
- 36 H. Underground Warning Tapes:
37 1. Provide materials that meet the codes or have the approvals listed below:
38 a. Office of Pipeline Safety Regulation, USAS Code B31.8.
39 b. GSA Public Building Service Guide Specification.
40 c. National Transportation Safety Board Report NTSB-PSS-73-1.
41 d. AGA Report 72-D-56.
42 e. API Report API RP 1109.
43 2. Material:
44 a. Plastic, continuous tape, color-coded, marked for hazard.
45 b. For Non-metallic Piping System:
46 (1) Aluminum foil core encased in plastic.
47 c. Metallic Piping:
48 (1) Plastic tape.
49 3. Color:
50 a. Colored (not printed color) plastic, coded for material conveyed by piping.
51 4. Width:
52 a. As scheduled for piping system burial depth.
53 5. Legend:
54 a. "Caution [System Name] Line Buried Below".

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- 1 6. Tape Colors:
- | Utility | Color |
|---------------------------------------|-----------------------------|
| Natural Gas, Oil, Dangerous Materials | Hi Visibility Safety Yellow |
| Communications | Safety Alert Orange |
| Water Systems | Safety Precaution Blue |
| Sewer Systems | Safety Green |
- 7 7. Model:
- 8 a. Metallic Piping System: Seton Polyethylene Tape.
- 9 b. Non-Metallic Piping System: Seton Metallic Detection Tape.
- 10
- 11 I. Underground Gas Piping:
- 12 1. Attach No. 18 gauge copper tracer wire to the piping and terminate above grade at each
- 13 end.
- 14
- 15 J. Pipeline Markers for Pipe Beneath Pavement and Slabs:
- 16 1. Minimum 2" round, square, or octagonal, same as specified in Subparagraph: Piping
- 17 System Devices.
- 18 2. Attachment:
- 19 a. 1-1/2" screw, bolted to tag as anchor.
- 20 b. Anchor Setting Compound: Epoxy or epoxy grout, compatible with the pavement.
- 21
- 22

23 **PART 3 EXECUTION**

24

25 **3.1 GENERAL**

- 26
- 27 A. Contractor shall verify room numbers with Owner/Engineer before nameplates are fabricated.
- 28
- 29 B. The following shall be permanently and clearly identified:
- 30 1. Each valve and pump.
- 31

32 **3.2 INSTALLATION**

- 33
- 34 A. Install signs on non-removable panels. Attach to equipment with pop rivets or stainless steel
- 35 screws.
- 36
- 37 B. Mount in an easily visible location.
- 38
- 39 C. All labeling identification shall conform to final room numbers. Coordinate with General
- 40 Contractor, Engineer and Owner to secure construction room numbers.
- 41
- 42 D. Provide all additional signage required by local authority at no cost to the Owner.
- 43
- 44 E. Complete installation in accordance with ANSI A13.1 and manufacturer's installation
- 45 instructions and with the Drawings. Fasten each unit securely in place with stainless steel
- 46 screws.
- 47
- 48 F. Equipment Labeling:
- 49 1. Install on scheduled items of equipment, including the following:
- 50 a. Water heaters
- 51 b. Pumps
- 52 c. Control panels and major control components
- 53 d. Other items of equipment
- 54 e. Include Mark Number and descriptive name from Drawing and Specification
- 55 schedules
- 56 f. Attach with corrosion resistant, stainless steel screws or pop rivets

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- 1 g. Install 1/2" diameter adhesive marker (color to be approved by Engineer), and apply
2 to T-bar below any mechanical equipment, valves, and fire dampers above lay-in
3 ceilings.
- 4 2. Spacing:
- 5 a. Where pipe passes through walls, floors, and other barriers.
- 6 b. In Tunnel Vaults and Equipment Rooms:
- 7 (1) Maximum spacing, 10 feet; closer where piping is congested, and where piping
8 continuity is obscured from view.
- 9 c. Piping in Tunnels:
- 10 (1) Maximum spacing 100 feet
- 11 d. Other Places:
- 12 (1) Maximum spacing 50 feet
- 13
- 14 G. Piping System Color Coding:
- 15 1. Designate for painter the following:
- 16 a. Types of piping services
- 17 b. Direction of flow
- 18 c. Other information required for proper identification.
- 19
- 20 H. Surfaces to be Painted:
- 21 1. Bare piping
- 22 2. Insulation covering of insulated piping
- 23
- 24 I. Paint according to the following schedule:
- 25

	Pastel
System	Color
Exposed Domestic Cold Water	Blue
Waste and Vent	None
Exposed Gas Piping	Black
- 26
- 27
- 28
- 29
- 30
- 31 J. Piping System Devices (Valves, Thermometers, Pressure Gages, etc.):
- 32 1. Identify with the following information:
- 33 a. System
- 34 b. Device number
- 35 c. Device Function
- 36 2. Device Chart:
- 37 a. Key devices to device chart
- 38 b. Give complete description of device function and system.
- 39
- 40 K. Key devices to drawings as follows:
- 41 1. Floor plans
- 42 2. Schematic drawings of piping systems
- 43
- 44 L. Underground Warning Tapes:
- 45 1. Tape Widths:
- 46

Piping Burial Depth	Tape Width
10"	2"
20"	3"
27"	6"
30"	9"
40"	12"
50" or more	18"
- 47
- 48
- 49
- 50
- 51
- 52
- 53

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- 1 M. Recommended Tape Bury Depth:
2 1. Minimum Depth:
3 a. 6".
4 2. Distance Between Pipe and Tape:
5 a. Minimum 12".
6 3. Maximum Depth:
7 a. 12".
8
9 N. Tie tape to pipe where pipe leaves the ground.
10
11 O. Pipeline Markers for Pipe Beneath Pavement and Slabs.
12 1. Location:
13 a. Accuracy:
14 (1) Plus or minus 6" from piping centerline.
15 b. Flat Edge Pavement and Slabs:
16 (1) Set within 6" of pavement or slab edge.
17 c. Concrete Curbs:
18 (1) Set in top of curb.
19 d. Spacing:
20 (1) Each change in direction, each edge of pavement or slab, maximum spacing
21 of 100'.
22
23 P. Legend:
24 1. Same as tags plus an engraved or stamped line; set marker with line parallel to buried
25 line.
26
27 Q. Attachment:
28 1. Drill hole for anchor bolt, full depth of bolt plus 1/2"; set full tag and bolt in epoxy, flush
29 with pavement or slab.
30
31

END OF SECTION

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
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SECTION 22 07 20

PIPING INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

- A. Fiberglass insulation
1. Applications:
 - a. Above ground domestic cold water
 - b. Roof drains
 - c. Horizontal portions of waste lines above grade which receive condensate from air handling units
 - d. Condensate drain lines
 - e. Domestic hot water piping
 - f. Hot water storage tanks
 - B. Closed Cell Insulation
 1. Closed cell insulation for piping in concrete masonry unit walls only.

1.3 RELATED SECTION

- A. Section 22 00 10 - Basic Plumbing Requirements

1.4 SUBMITTALS

- A. Product Data:
1. Provide submittal data on all equipment specified in this section in accordance with Section 22 00 10, General Conditions, and Division 01.
 2. Submit product data indicating typical catalog of information.
 3. Submit product data sheets indicating dimensions, general assembly, and ratings.
 4. Submit manufacturer's installation instructions and method of application.

1.5 REFERENCES

- A. Refer to Section 22 00 10 for complete names of references identified in this section.
- | | |
|-------------|---|
| ASTM E 84 | Fire and Smoke Ratings |
| ASTM C 547 | Standard Specifications for Mineral Fiber Pipe Insulation |
| ASTM C 585 | Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System) |
| ASTM C 795 | Standard Specifications for Thermal Insulation for Use in Contact with Austenitic Stainless Steel |
| ASTM C 1136 | Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation |
| NFPA 255 | Surface Burning Characteristics of Building Materials |
| UL 723 | Composite Surface Burning Characteristics |

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
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1 1.6 DEFINITIONS

2
3 A. Concealed:

- 4 1. Hidden from sight as in trenches, chases, furred spaces, walls, pipe shafts, or hung
5 ceilings.

6
7 B. Exposed:

- 8 1. Not "concealed" as defined above. Normally open and visible to building occupants (such
9 as gymnasiums).

10
11 1.7 QUALITY ASSURANCE

12
13 A. Fire Hazard Rating:

- 14 1. All insulation used on the project must have a flame spread rating not exceeding 25 and
15 a smoke developed rating not exceeding 50 as determined by test procedures ASTM
16 E84, NFPA 255 or UL 723. Insulation used in plenums must be listed and labeled as
17 such.
18 2. These ratings must be tested on the composite of insulation, jacket or facing, and
19 adhesive.
20 3. Components such as adhesives, mastics and cements must meet the same individual
21 ratings as minimum requirements.

22
23 B. Quality Controls:

- 24 1. All insulation shall be the product of reputable manufacturers.
25 2. All insulation shall be applied by mechanics skilled in the use of various materials, and in
26 the employ of a concern regularly engaged in the insulating business. Submit
27 qualifications of insulator with insulation submittals.
28 3. The materials shall be applied in accordance with the special materials as required by
29 these specifications and by the manufacturer standards.
30 4. Poor workmanship or appearance will be cause for rejection.

31
32 C. Insulations shall not contain formaldehyde, asbestos, lead, mercury, mercury compounds, or
33 poly-brominated diphenyl ether fire retardants.

34
35 D. Fiberglass insulations shall have a minimum of 50 percent recycled glass content; certified
36 and UL Validated.

37
38 E. Fiberglass insulations shall have a bio-based, formaldehyde-free binder and be UL
39 GREENGUARD Gold certified.

40
41
42 PART 2 PRODUCTS

43
44 2.1 GENERAL

- 45
46 A. Pipe covering insulation shall be manufactured for the sizes required for the particular system
47 and shall be suitable for installation on piping systems defined.

48
49 2.2 PIPE INSULATION

50
51 A. Fiberglass Insulation Manufacturers:

- 52 1. Johns Manville
53 2. Knauf Insulation
54 3. Owens/Corning
55 4. Manson Insulation
56

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- 1 B. Thickness:
- 2 1. Domestic Cold Water Piping:
- 3 a. 1 ¼ inch pipe diameter or smaller: ½ inch thick
- 4 b. 1 ½ inch pipe diameter or larger: 1 inch thick
- 5 2. Condensate Lines:
- 6 a. 1 ¼ inch pipe diameter or smaller: ½ inch thick
- 7 b. 1 ½ inch pipe diameter or larger: 1 inch thick
- 8 3. Waste Lines Which Receive Condensate:
- 9 a. 1 ¼ inch pipe diameter or smaller: ½ inch thick
- 10 b. 1 ½ inch pipe diameter or larger: 1 inch thick
- 11 4. Roof Drain Piping: 2 inch
- 12 5. Domestic Hot Water Piping (Up to 140 F):
- 13 a. 1 ¼ inch pipe diameter or smaller: 1 inch thick
- 14 b. 1 ½ inch pipe diameter or larger: 1 ½ inch thick
- 15 6. Outdoor Piping: 2 inch
- 16
- 17 C. Construction for fiberglass insulation (Above ground and crawlspace):
- 18 1. Fiberglass preformed pipe covering insulation complying with ASTM C 547, Type I (850
- 19 degrees F) or Type IV (1000 degrees F); ASTM C 585, ASTM C 411, ASTM C 795, and
- 20 UL/ULC Classified. Fiberglass bonded with a bio-based thermosetting resin.
- 21 2. Provide insulation with factory applied, white ASJ SSL, vapor retarder jacket complying
- 22 with ASTM C 1136. Thermal conductivity ASTM C 335 (k-value) at 75 degrees F mean
- 23 temperature shall be 0.23 Btu x in. /h x sq. ft. x degrees F, or less. Service temperature
- 24 range of 0 degrees F minimum to 1000 degrees F maximum.
- 25 3. Flame spread/Smoke-developed Rating (ASTM E84) of 25/50. Must be UL Environment
- 26 GREENGUARD Gold certified and UL Validated Formaldehyde-free.
- 27
- 28 D. Closed Cell Insulation Manufacturers (for concrete masonry wall installations only):
- 29 1. Armacell
- 30 2. Aeroflex
- 31
- 32 E. Construction for Closed Cell Insulation (for concrete masonry wall installations only):
- 33 1. Type: EPDM Closed-cell flexible elastomeric foam pipe insulation
- 34 a. Performance Criteria: Resistant to ultraviolet and biological degradation as
- 35 demonstrated by ASTM G7 and ASTM G90.
- 36 b. Temperature Range: -90°F to 220°F
- 37 c. Water Vapor Permeability (Dry Cup): Less than 0.03 per inch when measured by
- 38 ASTM E96.
- 39 d. Thermal Conductivity: 0.25 BTU-IN/HR-F2-°F or less at 75°F mean temperature
- 40
- 41 2.3 FLANGE, VALVE AND FITTING INSULATION
- 42
- 43 A. PVC Fitting Covers / Jacket Manufacturers:
- 44 1. Proto LoSmoke PVC
- 45 2. Zeston PVC
- 46
- 47 B. Metal Fitting Cover / Jacket Manufacturers:
- 48 1. RPR Products
- 49 2. Ideal Products
- 50
- 51 C. Exposed Piping:
- 52 1. Provide molded or mitered covers with full thickness matching adjacent covering.
- 53 2. Finish with white glass, reinforced white vapor barrier coating or white .020 inch thick
- 54 PVC jacketing with self-seal lap.
- 55

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- 1 D. 2½ Inch Diameter and Larger Concealed Piping:
2 1. Insulate fittings and valves with molded or mitered fitting covers.
3 2. Finish with white vapor barrier coating reinforced with white 10" x 10" reinforced mesh.
4
5 E. 2 Inch Diameter and Smaller Concealed Piping:
6 1. Insulate fittings and valves with mineral wool and insulating cement to a thickness equal
7 to or greater than adjoining straight pipe.
8 2. Molded or mitered fittings finished with white vapor barrier coating reinforced with
9 reinforced mesh may be provided.
10
11 F. Underground Piping:
12 1. Provide mitered covers with full thickness matching adjacent covering.
13 2. Field fabricated miter joints are not acceptable.
14 3. No insulation is required on underground domestic cold water piping.
15
16 G. Outdoor Piping:
17 1. Metal jacketing shall be 0.016" minimum aluminum or stainless steel with moisture
18 barrier, secured in accordance with jacket manufacturer's recommendations.
19 2. Use preformed fitting covers matching jacket used on straight pipe, with all joints sealed
20 with metal jacketing sealant.
21

22 2.4 SEALANT, ADHESIVE, AND FINISH
23

- 24 A. Sealant:
25 1. Manufacturers:
26 a. Foster 95-44
27 b. Childers CP-76
28 c. Vimasco Corporation
29 d. Mon-Eco Industries
30 2. Usage:
31 a. Valve Covers
32 b. Anchors
33 c. Hangers
34 d. Metal Jacketing
35 e. Flashing Penetrations
36
37 B. Adhesive:
38 1. Manufacturers:
39 a. Foster 85-20/85-60
40 b. Childers CP-127
41 c. Vimasco Corporation
42 d. Mon-Eco Industries
43 2. Usage:
44 a. Longitudinal laps of the vapor barrier jacket
45 b. Butt joint covers.
46
47 C. Weather Barrier Mastic
48 1. Manufacturers:
49 a. Foster 46-50
50 b. Childers CP-10
51 c. Vimasco Corporation
52 d. Mon-Eco Industries
53 2. Usage:
54 a. Used on above ambient piping/duct to protect insulation from weather.
55 b. Use in conjunction with reinforcing mesh.
56

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- 1 D. Vapor Barrier Coating:
- 2 1. Manufacturers:
- 3 a. Foster 30-33 Vapor Out
- 4 b. Childers CP-33 Chil Out
- 5 c. Vimasco Corporation
- 6 d. Mon-Eco Industries
- 7 2. Usage:
- 8 a. Glass fabric reinforcement.
- 9 b. Vapor stops.
- 10 c. Completing factory installed vapor retarders.

- 11 E. Reinforcing Mesh
- 12 1. Manufacturers:
- 13 a. Foster Mast Afab
- 14 b. Childers Chil-glass #10
- 15 c. Vimasco Corporation
- 16 d. Mon-Eco Industries
- 17 2. Usage:
- 18 a. Glass fabric reinforcement

20 2.5 INSULATION SHIELD

- 21 A. Field-fabricated:
- 22 1. Material:
- 23 a. High-density fiberglass insulation
- 24 2. Construction:
- 25 a. Insulation to support the bearing area at hangers and supports with a shield of
- 26 galvanized metal extending not less than 4 inches on either side of the support
- 27 bearing area, covering at least half of the pipe circumference. When pipe is guided
- 28 at top and bottom, metal shields should cover the whole pipe circumference. Adhere
- 29 metal shield to insulation so that metal will not slide with respect to insulation.
- 30 3. Schedule:
- 31 a. 3" and smaller pipe diameter:
- 32 (1) 12 inch insulated section, 18 gauge metal shield
- 33 b. Greater than 3" pipe diameter:
- 34 (1) 12 inch insulated section, 16 gauge metal shield
- 35
- 36
- 37 B. Factory-made:
- 38 1. Manufacturer:
- 39 a. Pipe Shields, Inc. or equal.
- 40 2. Type:
- 41 a. Proper shield for service and pipe span.
- 42 3. Construction:
- 43 a. Extend insulation at least 1 inch beyond metal.
- 44
- 45 C. Insulation shall not compress at hanger.
- 46
- 47
- 48

49 PART 3 EXECUTION

50 3.1 SITE INSPECTION

- 51 A. Before starting work under this section, carefully inspect the site and installed work of other
- 52 trades and verify that such work is complete to the point where installation of materials and
- 53 accessories under this section can begin.
- 54
- 55
- 56

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- 1 B. Verify that all materials and accessories can be installed in accordance with project drawings
2 and specifications and material manufacturers' recommendations.
3
- 4 C. Verify, by inspecting product labeling, submittal data, and/or certifications which may
5 accompany the shipments, that all materials and accessories to be installed on the project
6 comply with applicable specifications and standards and meet specified thermal and physical
7 properties.
8

9 3.2 PROPERTIES

- 10 A. Ensure that all pipe and fitting surfaces over which insulation is to be installed are clean and
11 dry. Remove materials that will adversely affect insulation application.
12
- 13 B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied
14 vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not
15 be acceptable for installation.
16
- 17 C. Ensure that pressure testing of piping and fittings has been completed prior to installing
18 insulation.
19

20 3.3 INSTALLATION

- 21 A. General:
22
 - 23 1. To ensure that it will achieve its highest possible performance and serve its intended
24 purpose, install all insulation materials and accessories in accordance with
25 manufacturer's published instructions (latest edition) and industry practices detailed by
26 the North American Commercial and Industrial Insulation Standards manual (latest
27 edition). Install insulation on piping subsequent to installation of heat tracing, painting,
28 and acceptance tests.
29
 - 30 2. Install insulation on piping subsequent to installation of heat tracing, painting, and
31 acceptance tests.
32
 - 33 3. Install insulation materials with smooth and even surfaces. Insulate each continuous run
34 of piping with full-length units of insulation, with single cut piece to complete run. Do not
35 use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure
36 complete, tight fit over all piping surfaces.
37
 - 38 4. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation,
39 protecting it against puncture, tears or other damage. All insulation shall be coated with
40 suitable vapor barrier coating to maintain vapor barrier integrity.
41
 - 42 5. All cold water, hot water and condensate drains routed in concrete masonry units shall
43 be insulated using closed cell insulation as noted in this specification.

44 3.4 PIPE

- 45 A. Insulation size shall match pipe size.
- 46 B. Insulation to be continuous through wall and ceiling penetrations.
- 47 C. Apply insulation to clean, dry pipes.
- 48 D. Butt insulation joints firmly together and apply butt strip. All pipe insulation terminations shall
49 be tapered and sealed.
- 50 E. Butt pipe insulation against hanger inserts. Seal jacketing according to type used. Create a
51 vapor stop on both ends of hanger inserts.
- 52 F. Seal longitudinal laps and butt strips with sealant in addition to the self-sealing laps.

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- 1 G. Seal joints with adhesive and staple at 2" O.C. with outwardly clenching staples.
2
3 H. Seal all joints with vapor barrier coating.
4
5 3.5 VALVES, FLANGES, AND FITTINGS
6
7 A. Insulate all valves, flanges, and fittings with covers secured with Velcro with equivalent
8 thickness and composition installation on straight pipes.
9
10 B. Finish with 1/4 inch layer of Foster 30-33 or Childers CP-33 reinforced with reinforcing mesh.
11
12 C. Factory made covers equal to Proto Corporation or Zeston are acceptable.
13
14 3.6 CONTROL VALVE COVERS
15
16 A. Fabricate special covers, complete with troweled-on vapor seal, shaped to accommodate the
17 valve stem. Insulation thickness shall be same thickness as adjoining pipe.
18
19 B. Seal covers to valve insulation properly with adhesive so that the seal may be broken with a
20 knife blade without damage to either part. Arrange so that cover can be removed and replaced
21 as necessary for operation of the valve.
22
23 C. Finish valve cover with glass cloth and two coats of vapor barrier coating.
24
25 D. Factory made covers are acceptable. Provide submittal.
26
27 3.7 ROOF DRAIN PIPING
28
29 A. Seal vapor tight to prevent any moisture from entering into the insulation.
30
31 B. Roof drains for canopies do not require insulation.
32
33 C. Roof drains that are exposed shall be insulated as described in the paragraph on exposed
34 piping.
35
36 D. Roof drain laterals which serve primary roof drains shall be insulated.
37
38 E. No insulation is required on concealed secondary roof drain piping.
39
40 F. Insulate all roof drain bodies (primary and secondary), first 3-feet of vertical pipe on secondary
41 laterals, and primary roof drain piping to a point seven feet downstream of the first elbow.
42
43 3.8 WASTE LINES WHICH RECEIVE CONDENSATE
44
45 A. Insulate from the drain receptor (i.e. floor sink, hub drain) all the way to where the drain line
46 changes to a vertical stack.
47
48 3.9 REPAIRS AND REPLACEMENT
49
50 A. Replace any insulation that gets wet, whether now dry or not.
51
52 B. Repair any damage caused by condensation due to improper insulating.
53

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- 1 3.10 ALL EXPOSED PIPING
2
3 A. All exposed piping insulation to be pre-formed pipe insulation with white PVC jacket and white
4 PVC fittings (no exceptions). All exposed roof drain primary and secondary downspouts, water
5 piping, condensate piping, and any other piping that requires insulation shall be insulated
6 down to the floor level using the pre-formed pipe insulation and PVC jackets and fittings.
7
- 8 3.11 OUTDOOR PIPING
9
10 A. Metal jacket shall be applied per manufacturer's recommendations. Longitudinal joints shall
11 be applied so they will shed water completely and be sealed completely with 1/8" bead of
12 metal jacketing sealant under each lap. Circumferential joints shall be closed using preformed
13 butt strips in accordance with manufacturer's recommendations.
14
- 15 3.12 SHIELDS
16
17 A. Metal jacketing shall be 0.016-inch minimum aluminum or stainless steel with moisture barrier,
18 secured in accordance with jacket manufacturer's recommendations. Use bands and seals of
19 the same material. Use preformed fitting covers matching jacket used on straight pipe, with all
20 joints weather sealed with 1/8" bead of metal jacketing sealant under each lap.
21
- 22 3.13 SHIELDS AND HANGERS
23
24 A. Piping hangers or anchors are not to be in direct contact with pipe. Hangers are to be on the
25 outside of the insulation with pipe shields at each hanger.
26
27 B. At the location of hangers or supports for pipes run above ground and finished with a vapor
28 seal insulation, provide rigid sections of, high density fiberglass, Foamglas, calcium silicate or
29 high density polyurethane, the same thickness as adjacent insulating material to adequately
30 support the pipe without compression of the insulating material and cover with a vapor seal
31 that is bonded to the adjacent insulation as described for fittings in the lines. Wood inserts
32 shall not be allowed. Hangers and supports for piping insulation to receive a vapor barrier shall
33 be installed exterior to the insulation.
34
35 C. Material Changes:
36 1. Wherever there is a change in materials on lines that are vapor sealed, apply a suitable
37 adhesive that is compatible with both materials, tapes, etc., as required to maintain the
38 vapor barrier.
39
40 D. Apply insulation around the hanger ring or anchor and pipe and carry vapor barrier upward
41 and outward along the hanger rod or anchor members to a point not less than 12 inches from
42 the adjacent pipe.
43
44 E. Take care to avoid puncturing the vapor seal.
45
46 F. Finish insulation as specified for flanges, and seal over adjacent vapor barrier jacket.
47
- 48 3.14 FIELD QUALITY ASSURANCE
49
50 A. Upon completion of all insulation work covered by this specification, visually inspect the work
51 and verify that it has been correctly installed. This may be done while work is in progress, to
52 assure compliance with requirements herein to cover and protect insulation materials during
53 installation.
54

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1 3.15 PROTECTION

2
3 A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with
4 vapor barrier damage and moisture-saturated insulation.

5
6 B. The insulation contractor shall advise the general and/or the mechanical/plumbing contractor
7 as to requirements for protection of the insulation work during the remainder of the
8 construction period, to avoid damage and deterioration of the finished insulation work.

9
10 END OF SECTION

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SECTION 22 16 01

NATURAL GAS PIPING AND APPURTENANCES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 22 00 10, apply to this Section.

1.2 SECTION INCLUDES

A. Natural gas piping

1.3 RELATED SECTIONS

A. Section 22 00 10 - Basic Plumbing Requirements

B. Section 22 05 24 - Valves - General

C. Section 22 05 30 - Pipe and Pipe Fittings - General

1.4 REFERENCES

ANSI/CSA LC-1	Fuel gas piping systems using Corrugated Stainless Steel Tubing (CSST)
ASTM A-53	Pipe, steel, black and hot-dipped, zinc coated, welded and seamless
ASTM A-240/A240M-09b	Standard specification for chromium and chromium-nickel stainless steel plate, sheet, and strip for pressure vessels and for general applications
ASTM D-2774	Underground installation of thermoplastic pressure piping
ASTM E84-09c	Standard test method for surface burning characteristics of building materials
ASTM F-1668	Construction procedures for buried plastic pipe
UL 181BM	Procedures for HVAC system design and installation
NFPA - 54	National Fuel Gas Code
AWS	American Welding Society
ASTM D2513	Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings
ASME B16.44	Manually operated metallic gas valves for use in gas piping systems up to 5 psi.
ANSI Z21.15	Manually operated gas valves for appliances, appliance connector valves, and hose end valves.

1.5 SUBMITTALS

- A. Product Data:
1. Provide submittal data on all equipment specified in this section in accordance with Section 22 00 10, General Conditions, and Division 01.
- B. Submittals shall include:
1. Pipe
 2. Pipe Supports

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- 1 3. Fittings
2 4. Regulators
3 5. Sleeving Materials
4 6. All accessories
5
6 C. Submit product data indicating typical catalog of information including arrangements.
7
8 D. Submit product data sheets indicating dimensions, general assembly, and materials used in
9 fabrication.
10
11 1.6 COORDINATION
12
13 A. Coordinate installation of the gas piping with the City.
14
15 B. Obtain approval from the City of all pipe sizes before installing any piping.
16
17 C. Call gas company and Notification Center before digging.
18
19 1.7 QUALITY ASSURANCE
20
21 A. All welders shall be certified by AWS or other accredited program.
22
23
24 PART 2 PRODUCTS
25
26 2.1 PIPING AND FITTINGS
27
28 **A. Press type fittings (equal to Megapress and Powerpress) will not be accepted as an**
29 **equal to welded and threaded fittings.**
30
31 B. Above the slab and within the interior of the building:
32 1. Standard weight, Schedule 40 black steel pipe with malleable iron fittings. Conform to
33 ASTM A-53. Threaded on all gas piping on roof 2 inches in diameter and smaller, butt
34 joint welded on roof on all 2-1/2" diameter and larger, and socket welded fittings on ALL
35 fittings and joints inside the building.
36
37 C. Outside of the building and below grade:
38 1. Polyethylene gas pressure pipe and fittings with fused joints.
39
40 D. Transition Service Riser:
41 1. Manufacturer/Model:
42 a. Central Plastics Co. (Shawnee, OK) 610-0111
43 2. Use for the underground riser leading into the building.
44
45 2.2 GAS COCKS
46
47 A. Type:
48 1. Brass with tee or square head for wrench operation.
49
50 2.3 UNIONS
51
52 A. Type:
53 1. Malleable iron, insulating type.
54

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- 1 2.4 VALVES
2
3 A. Provide an approved design which does not allow locking in the open position.
4
5 B. Larger than 2 inches:
6 1. Provide with a lubricated stop.
7
- 8 2.5 GAS PIPE SLEEVING
9
10 A. Pipe:
11 1. 10 gauge steel pipe, welded or PVDF for mechanical plenum returns.
12 2. Sleeving material in accordance with Local Authority having jurisdiction and per
13 mechanical system type
14
15 B. Prior to installation verify with City all approved methods of gas pipe sleeving.
16
- 17 2.6 SOCKET WELD FITTINGS
18
19 A. Manufacturer:
20 1. Anvil
21
- 22 2.7 ROOF PIPE SUPPORTS
23
24 A. Manufacturers:
25 1. MAPA MS-5
26 2. Miro Industries Model 3 RAH (3-inch or less)
27 3. Pipe Hangers and Devices (PHP) Model PP10
28 4. Portable Pipe Hangers (PHP) Model PP10
29 5. ERICO RPS 360407
30
31 B. Manufacturer to select correct size for size and weight of pipes.
32
33 C. Pipe models listed above are for 3-inch or smaller gas pipe.
34
35 D. All roof supports to be equal to MAPA Products Model MS-5, adjustable height, select size
36 designed for size of pipe supported. MS-5 for 4" and smaller.
37 1. Install 1/2" rubber walk pad under each pipe support.
38
39 E. MAPA MWP 1/2" thick rubber walk pad.
40 1. Coordinate exact locations of supports with roofing contractor.
41
42 F. Roof supports to support all gas piping a minimum of 6" above roof.
43 1. Coordinate exact locations of supports with roofing contractor.
44 2. Install 1/2" rubber walk pad under each pipe support.
45 3. Spacing of Supports (Horizontal):
46 1/2" 6 feet or less
47 3/4" or 1" 8 feet or less
48 1 1/4" or larger 10 feet or less
49 Install supports within 2 feet of every change of direction.
50 4. Spacing of Supports (Vertical):
51 1/2" 6 feet or less
52 3/4" or 1" 8 feet or less
53 1 1/4" or larger 10 feet or less
54 Install supports within 2 feet of every change of direction.
55 At least every floor level install supports within 2-feet of every direction.

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1 2.8 MEDIUM PRESSURE REGULATORS

2
3 A. Manufacturers:

- 4 1. Itron B34 Series or as shown on drawings.
5 2. Fisher or equivalent
6

7 2.9 GAS METERS

- 8
9 A. Make all arrangements with local gas utility company to obtain gas service. Coordinate exact
10 location of meter, correct size, and pressure with gas utility company as indicated on plans.
11

12
13 PART 3 EXECUTION

14 3.1 POLYETHYLENE PIPING

- 15
16 A. Install a minimum of 18 inches deep.
17
18 B. Attach a number 18 copper tracer wire to the piping and terminate above grade at both ends.
19
20 C. Do not bend the piping to a radius of less than 20 times the nominal diameter of the pipe.
21
22 D. Installed piping with enough slack to ensure that it will not be subjected to thermally induced
23 strain which could damage the piping system.
24
25 E. Fusion joints according to manufacturer's instruction.
26
27

28 3.2 BLACK STEEL PIPING

- 29
30 A. Make all joints above grade and on roof gas piping 2-1/2" and larger by welding.
31
32 B. Do not install steel piping underground, except at risers.
33
34 C. Protect all underground black steel piping, (including underground riser to a point at least 6
35 inches above grade) where exposed on the exterior against corrosion by means of yellow
36 "polyken" wrapping, 3M #51 "Scotchwrap", or Republic Steel's "X-Tru-Coat". Gas pipe
37 protective coatings shall be approved types, machine applied conforming to recognized
38 standards.
39
40 D. Field wrapping shall provide equivalent protection and is restricted to those short sections and
41 fittings necessarily stripped for threading or welding.
42
43 E. Provide a #17 anode, insulating fittings, etc., for cathodic protection at the meter and each
44 entry underground.
45

46 3.3 GAS COCKS

- 47
48 A. Provide all final connections with gas cocks.
49
50 B. Mount gas cocks in vertical pipes only on all rooftop gas-fired equipment.
51

52 3.4 GAS TURRETS IN SCIENCE/BIOLOGY/CHEMISTRY LABS

- 53
54 A. Plumbing contractor to provide low pressure gas piping, routed behind casework or in wall to
55 each and every gas turret on laboratory casework. Coordinate all turret locations with the
56 architect's laboratory casework plan.

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1 3.5 VALVES
2

- 3 A. Provide all outlets at individual sites and any building supplied by the system with a readily
4 accessible approved valve.
5
6 B. Install valves in the gas piping within 3 feet of each appliance and ahead of the union connection.
7

8 3.6 MEDIUM PRESSURE REGULATORS
9

- 10 A. All regulators shall be located in mechanical rooms, or on roofs as shown on plans.
11
12 B. Each regulator shall have a separate vent to the outside.
13
14 C. Each regulator shall be installed with an approved gas valve upstream of each regulator.
15
16 D. Gas regulators to be installed no closer than 10'-0" to any outside air intake.
17

18 3.7 GAS PIPE SLEEVING LOCATIONS
19

- 20 A. Sleeve all gas piping routed in concrete masonry walls and extend vent up through gooseneck
21 roof termination. Gas piping routed down ICF or tilt wall panels shall not be routed in these
22 walls. Route down along these wall types in chase wall.
23
24 B. Vent all science/biology/chemistry valve enclosures up thru roof and terminate on roof with a
25 gooseneck. Coordinate all valve enclosures with electrical contractor. Furnished by the
26 electrical contractor and installed by the plumbing contractor.
27
28 C. Sleeve all gas pipe roof penetrations from the hooded roof penetration thru the roof decking.
29 Penetration at decking to be cut neatly and shall match the perimeter of pipe to allow fire putty
30 application.
31
32 D. At the main gas line building entry up to roof, sleeve gas piping from the point of entry up to
33 the hooded roof penetration.
34
35 E. All gas lines serving science/biology/chemistry demonstration desk will be sleeved in schedule
36 10 black steel (for plenum returns) 40 PVC pipe and fittings. Pipe and fittings to be glued and
37 tested for leaks before backfilling. Sleeve ends to extend no less than 6" above slab.
38
39 F. Sleeve all gas piping routed down in walls that are fire rated or are sound walls that have
40 sheetrock extending up to the bottom side of the roof decking. Sleeve to terminate on room
41 side of entry point and exit point of gas piping.
42
43 G. All sleeving to be schedule 10 black steel , welded for buildings with plenum return mechanical
44 systems.
45

46 3.8 SOCKET WELD FITTING LOCATIONS
47

- 48 A. All interior gas piping in all locations (other than those locations in section 3.7 of this
49 specification) to be installed using socket weld fittings. Install per manufacturers
50 recommendations.
51

52 3.9 UNIONS
53

- 54 A. Install a union at every fifty feet of roof piping, every change in direction, and at each gas
55 regulator assembly, as noted on gas regulator detail.
56

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- 1 3.10 CONNECTIONS TO EQUIPMENT
2
3 A. Connect the gas piping with pipe fittings.
4
5 B. Provide for thermal expansion for straight runs of pipe over 100 feet.
6
7 C. Flexible connectors will not be allowed to any equipment. Connect with black steel pipe and
8 unions.
9
- 10 3.11 CORRUGATED STAINLESS STEEL TUBING (CSST) PIPE
11
12 A. Use only when shown on plans and in concealed areas inside building serving science labs.
13
14 B. Sleeve: All pipe in accordance with Local Codes.
15
- 16 3.12 GAS METER
17
18 A. Coordinate with gas utility.
19
- 20 3.13 SLOPE
21
22 A. Slope all pipe a minimum of 1/4 inch per 15 feet to prevent traps. All horizontal lines shall
23 slope to the risers and slope from the risers to the meter or to a service regulator when a meter
24 is not provided.
25
26 B. If a trap is unavoidable, a drip leg shall be installed. Drip legs shall be installed at the meter
27 and at all appliances. Drip leg to be a minimum of 4" from tee turn down to cap.
28
- 29 3.14 PAINTING
30
31 A. Paint in accordance with architectural specifications and color selected by Architect. Color to
32 be flat black on roof and to match wall color on vertical riser to roof if color not otherwise
33 instructed.
34
- 35 3.15 INSPECTION
36
37 A. Do not enclose or cover any work until it has been inspected, tested and accepted by local
38 authority having jurisdiction.
39
- 40 3.16 TESTING
41
42 A. Procedure:
43 1. Subject gas piping systems to a pneumatic pressure test of 60 pounds per square inch
44 for 30 minutes.
45 2. While the systems are subject to this air pressure, apply a soapy water solution to all
46 welded joints for the purpose of detecting minute, as well as larger leaks.
47 3. If leaks are found in welded lines, repair by chipping and rewelding operations.
48 4. Repeat alternate testing and rewelding operations until the gas piping systems are
49 absolutely tight.
50 5. If leaks occur at threaded joints, eliminate such leaks by replacing the fittings or properly
51 tightening them.
52 6. Finally, subject the entire gas piping system to a pneumatic pressure test of 50 psi for a
53 period of 24 hours and demonstrate that the piping system is absolutely tight.
54

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- 1 B. Perform any other tests as required by the City or other governing bodies.
- 2
- 3

END OF SECTION

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HEATING, VENTILATING AND AIR-CONDITIONING (HVAC)

DIVISION 23

23 00 00	Basic Mechanical Requirements
23 00 90	HVAC Submittal Procedures
23 05 19	Meters and Gauges for HVAC Piping
23 05 29	Hangers and Supports for HVAC Piping and Equipment
23 05 53	Identification for HVAC Piping and Equipment
23 05 93	Testing, Adjusting, and Balancing for HVAC
23 07 19	Hydronic Piping Insulation
23 08 00	Commissioning of Heating, Ventilating and Air Conditioning (HVAC)
23 09 25	Variable Frequency Drives
23 21 13	Hydronic Piping, Valves and Appurtenances
23 21 23	Hydronic Pumps
23 52 16	Condensing Boilers

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SECTION 23 00 00

BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, and Division 01 Specifications apply to this Section.

1.2 SECTION INCLUDES

A. Basic mechanical requirements necessary to provide complete installation of all Division 23 work.

1.3 WORK INCLUDED

A. This section of work comprises furnishing of all materials, equipment, tools, scaffolding, rigging, hoisting, labor and transportation necessary for the complete installation of the mechanical systems as shown on the plans and as specified herein.

B. Bidders shall determine the contents of a complete set of drawings and specifications and be aware that they may be bidding from a partial set of drawings, applicable only to the various separate contracts, subcontracts, or trades as may be issued for bidding purposes only. The contract documents and the complete scope of work for the project are illustrated on the combined Heating, Ventilating, Air Conditioning and Electrical, and each Bidder shall thoroughly acquaint himself with all the details of the complete set of drawings and specifications before submitting his bid. All drawings and specifications form a part of the contract documents for each separate contract and shall be considered as bound therewith in the event partial sets of plans and specifications are issued for bidding only. The submission of bids shall be deemed evidence of the review and examination of all drawings, specifications, and addenda issued for this project as no allowances will be made because of unfamiliarity with any portion of the complete set of documents.

1.4 CODES & REFERENCE STANDARDS

A. General:

1. Perform all Division 23 work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are modified by the contract documents.
2. Nothing in the Contract Documents shall be construed to permit work not conforming to these codes.
3. When two or more codes or standards are applicable to the same work, then the stricter code or standard shall govern.
4. The date of the code or standard that is in effect on the date of issue of the contract documents except when a particular publication date is specified.
5. The Contractor shall be held responsible for verifying all local codes and ordinances that may alter any part of the plans or specifications. The Contractor shall bear all costs for correcting the deficiencies.
6. Where local codes and ordinances are not in writing or on record, but a local precedence has been set, the Owner shall pay for any additional cost incurred.

B. Applicable Codes and Standards for All Division 23 Work:

1. Uniform Building Code

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- 1 2. Uniform Gas Code
- 2 3. Uniform Plumbing Code
- 3 4. Uniform Mechanical Code
- 4 5. Uniform Energy Conservation Code
- 5 6. National Electrical Code
- 6 7. American Society of Heating, Refrigerating and Air Conditioning Engineers Standards.
- 7 8. Occupational Safety and Health Administration Standards:
 - 8 a. OSHA Standard 2207 - Construction Industry Standards
 - 9 b. OSHA 29 CFR Part 1926 - Regulation of Excavation
 - 10 c. Texas Underground Facility Damage Prevention Act (H.B. 2295)
 - 11 d. All other applicable standards
- 12 9. National Fire Protection Association:
 - 13 a. NFPA No. 90A Installation of Air Conditioning and Ventilating Systems
- 14 10. Texas State Board of Insurance Standards
- 15 11. Clean Air Act and Clean Air Act Amendments
- 16 12. State Codes:
 - 17 a. Texas Department of Labor Boiler Rules and Regulations
 - 18 b. All other applicable codes
- 19 13. Local Municipal Codes and Ordinances

20

21 1.5 SCHEDULE OF ABBREVIATIONS

22

23 A. Reference Standards are listed in Section 23 using abbreviations listed below:

24

25	AABC	Associated Air Balance Council
26	AASHTO	American Association of State Highway and Transportation Officials
27	ADA	Americans with Disabilities Act
28	ADC	Air Diffusion Council
29	A/E	Architect/ Engineer
30	AGA	American Gas Association
31	AMCA	Air Moving and Conditioning Association
32	ANSI	American National Standards Institute
33	AHRI	Air-Conditioning and Refrigeration Institute
34	ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
35	ASME	American Society of Mechanical Engineers
36	ASPE	American Society of Plumbing Engineers
37	ASTM	American Society for Testing and Materials
38	AWE	American Welding Society
39	AWWA	American Water Works Association
40	CGA	Compressed Gas Association
41	CISPI	Cast Iron Soil Pipe Institute
42	CS	Commercial Standard
43	CSA	Canadian Standards Association
44	DIPRA	Ductile Iron Pipe Research Association
45	DOT	Department of Transportation
46	DOC	Department of Commerce
47	FCC	Federal Communications Commission
48	FM	Factory Mutual
49	FS	Federal Specification
50	GSHPA	Ground Source Heat Pump Association
51	IBC	International Building Code
52	ITL	Independent Testing Laboratories
53	NEC	National Electric Code
54	NFPA	National Fire Protection Association
55	NSF	National Sanitation Foundation
56	OSHA	Occupational Safety and Health Administration

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1	PDI	Plumbing and Drainage Institute
2	SMACNA	Sheet Metal and Air Conditioning National Association
3	TCEQ	Texas Commission on Environmental Quality
4	TDH	Texas Department of Health
5	TWC	Texas Water Commission
6	UBC	Uniform Building Code
7	UL	Underwriters Laboratories

8
9 1.6 QUALITY ASSURANCE

- 10 A. Provide complete installations of all systems.
- 11
- 12 B. Furnish all items of equipment, material, and labor to complete the Contract even though each
- 13 and every item necessary is not specifically mentioned or shown.
- 14
- 15 C. In case of any conflict between the specifications, plans and ordinances, the ordinances
- 16 shall govern.
- 17
- 18 D. All materials furnished under this Contract shall be new, free from defects of any kind, of the
- 19 quality and design hereinafter specified, and shall conform to the standards of Underwriter's
- 20 Laboratories Inc., except for equipment which U.L. does not list or provide label service.
- 21
- 22 E. All mechanical equipment and fixtures shall be the same brand unless scheduled differently
- 23 on plans.
- 24
- 25 F. Contractor's Responsibility:
- 26
- 27 1. Erect barricades, protective fencing, and signs to prevent injury to personnel on site.
- 28
- 29 2. Make permanent connection to utilities or existing lines. Determine depth and location,
- 30 and bid accordingly.
- 31
- 32 3. Relocate and repair any existing lines cut by general construction work.
- 33
- 34 4. Pay all costs in connection with metering devices.
- 35
- 36 5. Plans do not show exact location and elevations of lines, nor do they show all offsets
- 37 required.
- 38
- 39 6. Deviate from plans as required to conform to the general construction and provide proper
- 40 grading.
- 41
- 42 7. Maintain all utility services during construction to existing portions of job that remain.
- 43
- 44 8. Procure and pay for all necessary permits or licenses to carry out the work.
- 45
- 46 9. Obtain and pay for all the necessary certificates of approval which must be delivered to
- 47 the A/E before final acceptance of the work.
- 48
- 49 10. Periodically remove rubbish, clean or repair all surfaces marred by the work required
- 50 under this contract.
- 51
- 52 11. Protect work from damage by other trades.
- 53
- 54 12. Make all tests required by law; pay all costs in connection with the testing.
- 55
- 56 13. Where job conditions require changes in indicated locations and arrangement, make such
- changes without extra cost to Owner.
14. Provide motor starters, controls, relays, all low-voltage wiring, conduit and wiring related to HVAC and other equipment and devices to form a complete working system. See Section 26 00 00.

50 1.7 DEFINITIONS

- 51
- 52 A. Approval:
- 53 1. It is understood that approval must be obtained from the A/E in writing before proceeding
- 54 with the proposed work.
- 55
- 56 2. Approval by the A/E of any changes, submitted by the Contractor will be considered as
- general only to aid the Contractor in expediting his work.

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- 1 B. Contractor:
- 2 1. The Contractor engaged to execute the work included in a particular section only, even
- 3 though he may be technically described as a Subcontractor to the General Contractor.
- 4 2. If the Contractor engaged to execute said work employs Sub-Contractors to perform
- 5 various portions of the work included under this Section, he shall be held responsible for
- 6 the execution of same, in full conformity with Contract Document requirements.
- 7 3. The Contractor shall cooperate at all times and shall be responsible for the satisfactory
- 8 cooperation of his Subcontractors with the other Contractors on the job so that all of the
- 9 various phases of the work may be properly coordinated without unnecessary delays or
- 10 damage to any parts of the work of any Contractor.

- 11
- 12 C. Provide:
- 13 1. Defined as requiring the furnishing and installing of the item or facility indicated, complete
- 14 in all respects and ready for operation unless otherwise specifically noted.
- 15

16 1.8 WARRANTY

- 17
- 18 A. The Contractor shall warranty his work against defective materials and workmanship for a
- 19 period of one year from date of acceptance of the job.
- 20
- 21 B. Neither the final payment nor any provisions in Contract Documents shall relieve the
- 22 Contractor of the responsibility for faulty materials or workmanship.
- 23
- 24 C. He shall remedy any defects due thereto, and pay for any damage to other work resulting
- 25 therefrom, which shall appear within a period of one year from date of substantial completion.
- 26
- 27 D. The Owner shall give notice of observed defects with reasonable promptness.
- 28
- 29 E. This Guarantee shall not be construed to include the normal maintenance of the various
- 30 components of the system covered by these specifications.
- 31

32 1.9 SITE VISIT

- 33
- 34 A. Before submitting his proposal, each bidder shall examine all plans and specifications relating
- 35 to the work, shall visit the site of the project and become fully informed of the extent and
- 36 character of the work required.
- 37
- 38 B. No consideration will be granted for any alleged misunderstanding of the materials to be
- 39 furnished or the amount of work to be done, it being fully understood that the tender of a
- 40 proposal carries with it the agreement to all items and conditions referred to herein, or
- 41 indicated on the accompanying plans or required by nature of the site of which may be fairly
- 42 implied as essential to the execution and completion of any and all parts of the work.
- 43

44 1.10 SUBMITTALS

- 45
- 46 A. Refer to Section 23 00 90 for submittal procedures.
- 47

48 1.11 PROJECT RECORD DOCUMENTS

- 49
- 50 A. The Contractor shall keep a set of plans on the job, noting daily all changes made in
- 51 connection with the final installation including exact dimensioned locations of all new and
- 52 uncovered existing utility piping outside the building.
- 53
- 54 B. Upon submitting his request for final payment, he shall turn over to the A/E, for subsequent
- 55 transmittal to the Owner, a clean, neatly marked set of reproducible plans showing "as
- 56 installed" work and an electronic file with changes of materials.

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- 1 C. In addition to the above, the Contractor shall accumulate during the job's progress the
2 following data, in duplication (2 each), prepared in 3 ring binders of sufficient size, black in
3 color, neat in appearance, and turned over to the A/E for checking and subsequent delivery to
4 the Owner. Electronic copies of the following are also acceptable, but they must be saved to
5 a single flash drive or external hard drive:
6 1. All warranties, guarantees and manufacturer's directions on equipment and material
7 covered by the Contract.
8 2. Approved fixture brochures.
9 3. Copies of approved shop drawings.
10 4. Set of operating instructions. Operating instructions shall also include recommended
11 maintenance and seasonal changeover procedures.
12 5. Any and all other data and/or plans required during construction.
13 6. Repair parts lists of all major items and equipment including name, address and
14 telephone number of local supplier or agent.
15
16 D. The first page, or pages, shall have the names, addresses, and telephone numbers of the
17 following:
18 1. General Contractor and all sub-contractors.
19 2. Major Equipment Suppliers.

20
21 1.12 TRAINING

- 22
23 A. Upon completion of the work and at a time designated by the Owner's representative, provide
24 a formal training session for the Owner's operating personnel to include location, operation,
25 and maintenance of all mechanical equipment and systems, some sections have further
26 instructions.
27
28 B. Before proceeding with instruction, prepare a typed outline in triplicate listing the subjects that
29 will be covered. Submit the outline for review by the Owner's representative.
30
31 C. At the conclusion of the instruction, obtain the signatures of the attendees on each copy of the
32 outline to signify that they have a proper understanding of the operation and maintenance of
33 the system. Submit the signed outlines to the Owner's representative and Engineer as a
34 condition of final acceptance.
35

36 1.13 PLANS AND SPECIFICATIONS

- 37
38 A. The plans show diagrammatically the locations of the various lines, ducts, conduits, fixtures,
39 and equipment and the method of connecting and controlling them.
40
41 B. It is not intended to show every connection in detail and all fittings required for a complete
42 system.
43
44 C. The systems shall include but are not limited to the items shown on the plans.
45
46 D. Exact locations of these items shall be determined by reference to the general plans and
47 measurements of the building and in cooperation with other contractors, and in all cases, shall
48 be subject to the approval of the A/E.
49
50 E. The A/E reserves the right to make any reasonable change in the location of any part of this
51 work without additional cost to the Owner.
52
53 F. Contractor, subcontractor, vendors and suppliers are required to waive subrogation against
54 Owner and Engineer.
55

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1 1.14 UTILITIES, LOCATIONS, AND ELEVATIONS
2

- 3 A. Locations and elevations of the various utilities within the scope of this work have been
4 obtained from the City and/or other substantially reliable sources and are offered separately
5 from the Contract documents, as a general guide only, without guarantees as to accuracy.
6
- 7 B. The Contractor shall examine the site, shall verify to his own satisfaction the locations,
8 elevations and availability of all utilities and services required, and shall adequately inform
9 himself as to their relation to the work; the submission of bids shall be deemed evidence
10 thereof.
11
- 12 C. The Contractor shall coordinate all services with the Utility Companies during construction,
13 coordinate changes made by Utility Companies to the design of project, and coordinate with
14 the Owner, A/E, and Utility the scheduling of any shutdowns or delays that may occur in
15 providing service.
16
- 17 D. The Contractor shall verify location, conduct all necessary tests, inspections, coordinate with
18 Owner's representatives and utilities, and check for existing underground utilities and lines
19 before ditching.
20
- 21 E. The Contractor shall be responsible for repair of any cut or damaged lines or utilities he
22 uncovers. There are lines and utilities not shown on any plans.
23

24 1.15 SUBSTITUTION OF PRODUCTS
25

- 26 A. Substitution of products specified herein will be considered only when a complete list of
27 proposed alternative equipment is submitted to the Engineer in writing, supported by adequate
28 technical and cost data. This includes a complete description of the proposed substitution,
29 drawings, catalog cuts, performance data, test data, or any other data or information
30 necessary for evaluation.
31
- 32 B. All proposed substitutions and data must be received by the Engineer no less than ten working
33 days prior to the schedule date for opening of bids.
34
- 35 C. The Engineer will consider all such submittals and the A/E will issue an addendum listing items
36 which the Engineer considers acceptable. Only such items as specified or approved as
37 acceptable will be installed on this project.
38
- 39 D. Manufacturers' names are listed herein and on the plans to establish a standard of quality and
40 design. Where a manufacturer's name is mentioned, products of other manufacturers will be
41 acceptable, if in the opinion of the Engineer, the substitute material is of equivalent quality or
42 better than that of the material specified.
43
- 44 E. The Contractor's Bid represents that the bid price is based solely upon the materials and
45 equipment described in the Bid Documents (including addenda, if any) and that he
46 contemplates no substitutions or extras.
47
- 48 F. Requests for substitution are understood to mean that the Contractor:
49 1. Has personally investigated the proposed substitution and determined that it is equal or
50 superior in all respects to that specified.
51 2. Will provide the same guarantee for the substitution that he would for that specified.
52 3. Will, at no cost to the Owner, replace the substitute item with the specified product if the
53 substitute item fails to perform satisfactorily.

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- 1 4. After Award of the Contract, substitutions will be considered only under one or more of
- 2 the following circumstances:
- 3 a. The substitution is required for compliance with subsequent interpretations of code
- 4 or insurance requirements.
- 5 b. The specified product is unavailable through no fault of the Contractor.
- 6 c. The manufacturer refuses to warranty the specified products as required.
- 7 d. Subsequent information that the specified product is unable to perform properly or
- 8 to fit in the designated space.
- 9 e. In the Engineer's sole judgment, the substitution would be in the Owner's best
- 10 interest.
- 11 5. Revisions to the mechanical system shall be under the supervision of the Engineer at a
- 12 standard hourly rate charged by the Engineer and shall be paid by the Contractor
- 13 originating the changes.

14
15 1.16 PROTECTION OF EQUIPMENT AND MATERIALS

- 16
- 17 A. The Contractor shall take such precautions as may be necessary to properly protect his
- 18 apparatus from damage.
- 19
- 20 B. This shall include the creation of all required temporary shelters to adequately protect any
- 21 apparatus above the floor of the construction and the covering of apparatus in the completed
- 22 building with tarpaulins or other protective covering.
- 23
- 24 C. Failure to comply with the above to the satisfaction of the Owner's inspector will be sufficient
- 25 cause for the rejection of the equipment in question and its complete replacement by this
- 26 Contractor.
- 27
- 28 D. All apparatus shall be cribbed up from the floor or ground by the Contractor and covered with
- 29 tarpaulins or other protective covering where necessary or directed.
- 30

31 1.17 FINAL INSPECTION

- 32
- 33 A. It shall be the duty of this Contractor to make a careful inspection trip of the entire project,
- 34 assuring himself that the work on the project is ready for final acceptance before calling upon
- 35 the A/E to make a final inspection.
- 36
- 37 B. To avoid delay of final acceptance of the work, the Contractor shall have all necessary bonds,
- 38 warranties, receipts, affidavits, etc., called for in the various articles of these specifications,
- 39 prepared and signed in advance, together with a letter of transmittal, listing each paper
- 40 included, and shall deliver the same to the A/E at or before the time of said final inspection.
- 41 The Contractor is cautioned to check over each bond, receipt, etc., before preparing for
- 42 submission to verify that the terms check with the requirements of the specifications.
- 43

44 1.18 ASBESTOS

- 45
- 46 A. No asbestos or asbestos containing materials shall be permitted in this project.
- 47

48 1.19 CUTTING AND PATCHING

- 49
- 50 A. All Subcontractors shall notify the General Contractor sufficiently ahead of construction of any
- 51 floors, walls, ceiling, roof, etc., of any openings that will be required for his work.
- 52
- 53 B. He shall see that all sleeves required for his work are set at proper times so as to avoid delay
- 54 of the job.
- 55

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- 1 C. All necessary cutting of walls, floors, partitions, ceilings, etc., as required for the proper
2 installation of the work under this Contract shall be done at the Subcontractor's expense in a
3 neat and workmanlike manner, and as approved by the A/E.
4
5 D. No joists, beams, girders or columns shall be cut by any Contractor without first obtaining
6 written permission of the A/E.
7
8 E. Patching of openings and/or alterations shall be provided by the General Contractor.
9
10 F. All openings in firewalls and floors shall be completely sealed after installation for a completely
11 airtight installation. Sealing material shall be non-combustible and UL approved. The installed
12 sealing assembly shall not cause the fire rating of the penetrated structure to be decreased.
13
14 G. All openings in exterior walls shall be sealed watertight.

15
16 1.20 IDENTIFICATION

- 17
18 A. Refer to Section 23 05 53.
19

20 1.21 MANUFACTURER'S INSTRUCTIONS

- 21
22 A. All equipment and devices shall be installed in accordance with these plans and specifications,
23 manufacturer's instructions and applicable codes.
24
25 B. Where specifications call for installation of a product to be in accordance with manufacturer's
26 instructions and/or where manufacturer's instructions are required for installation of a product,
27 it shall be the contractor's responsibility to obtain the necessary applicable manufacturer's
28 instructions and install the product in accordance with the manufacturer's instructions.
29
30 C. It shall be the Contractor's responsibility to install all equipment, materials, and devices shown
31 on the plans and as called out in these specifications even if manufacturer's instructions are
32 absolutely unattainable.
33

34 1.22 RELATED WORK

- 35
36 A. Whether specifically identified or not, it is the responsibility of the Mechanical Contractor to
37 coordinate all mechanical work with all related trades.
38

39 1.23 ELECTRICAL WIRING AND EQUIPMENT FOR MECHANICAL SYSTEMS

- 40
41 A. All wiring, conduit, boxes, equipment (controls, thermostats, relays, contactors, motor starters,
42 heaters, switches) and any other control devices or equipment required to form a complete
43 and properly operating system, shall be the responsibility of the Mechanical Contractor.
44
45 B. The Electrical Contractor shall only provide line voltage (including hook-up) to all mechanical
46 equipment.
47
48 C. All mechanical controls and devices shall be low voltage unless otherwise noted or shown on
49 the plans. Where line voltage controls or devices are noted, the Contractor shall provide
50 complete wiring diagrams (approved by the Engineer) to the Electrical Contractor prior to final
51 hook-up.
52
53 D. All electrical resistance heating elements which are scheduled to be served by three-phase
54 electrical power shall impose an equal electrical load on all phases. Electrical resistance
55 elements which are not balanced over all three phases are not acceptable.
56

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1 E. The Mechanical and Electrical plans are based on the equipment and devices scheduled as
2 shown on the plans or as called for in the specifications. Should any mechanical equipment
3 or device be changed or approved from those which are shown or noted, all electrical and/or
4 mechanical changes shall be made at the expense of the trade or contractor initiating the
5 change with no expense to the Owner, Architect, Engineer or their representatives.
6

7 F. All wiring provided by this Contractor shall be installed in a workmanlike manner using tie
8 wraps, labels, anchors and etc. Loose wiring is not acceptable.
9

10 G. All conduit and boxes required in all walls for control purposes (thermostats, etc.) shall be
11 provided by electrical contractor. All conduit required in attic, clear spaces, or on roof shall be
12 by mechanical contractor.
13

14 1.24 DEMOLITION AND REMODEL
15

16 A. It shall be the responsibility of this Contractor to see that all demolition and remodeling work
17 involving his trade (including but not limited to chilled and hot water piping used for space
18 cooling and heating, condensate lines, air handlers, mechanical equipment, etc.) is
19 accomplished in a manner and completeness to provide the appearance of new construction
20 work.
21

22 B. Abandoned air conditioning units shall be removed and disposed of off-site in a legal
23 manner.
24

25 C. Any usable equipment and/or structure damaged during demolition and remodel work shall be
26 replaced.
27

28 D. All abandoned and/or otherwise unused piping shall be securely capped using materials of
29 the same composition as the original piping.
30

31 E. No exposed piping and/or other materials will be permitted in the finished job.
32

33 F. Any abandoned piping which penetrates the slab in an exposed area shall be securely capped
34 below the slab.
35

36 1.25 OPERATION PRIOR TO COMPLETION
37

38 A. When any piece of mechanical or electrical equipment is operable and the Contractor needs
39 to operate the equipment, he may do so providing that he properly supervises the operation.
40

41 B. The warranty period shall, however, not commence until such time as the equipment is
42 operated for the beneficial use of the Owner.
43

44 C. Regardless of whether or not the equipment has or has not been operated, the Contractor
45 shall properly clean the equipment, install clean filter media, properly adjust and complete all
46 punch list items before final acceptance by the Owner.
47

48 D. The date of acceptance and the start of the warranty may not be the same date.
49

50 1.26 SAFETY GUARDS
51

52 A. Contractor shall furnish and install all safety guards required. All belt driven equipment,
53 projecting shafts and other rotating parts shall be enclosed or adequately guarded.
54

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- 1 1.27 FLAME SPREAD PROPERTIES OF MATERIALS
2
3 A. All materials and adhesives used for air conditioning filters, acoustical lining and insulation
4 shall conform to NFPA and UL life and flame spread properties of materials.
5
6 B. The composite classifications shall not exceed the flame spread rating and the smoke
7 development rating as outlined by NFPA 255/ ASTM E-84 for the basic material, the finishes,
8 adhesives, etc., specified for each system, and shall be such when completely assembled.
9
- 10 1.28 FILTER ASSEMBLIES
11
12 A. All filter housings and assemblies shall be factory built and supplied with the unit. A separate
13 filter rack may be required and is the responsibility of the mechanical contractor to provide.
14
15 B. Access doors (panels) which must be opened to change the air filters shall be labeled "Filter
16 Access" and the number and size of required filters shall be identified.
17
18 C. No piping conduit etc. shall be installed in front of this access door.
19
20 D. Install clean filters prior to substantial completion.
21
22 E. All air handlers shall have filters installed upstream of all coils.
23
- 24 1.29 LEAD MATERIALS
25
26 A. No lead or lead containing materials shall be allowed in any domestic or potable water supply
27 piping, valves, fixtures, components, equipment or any other item.
28
- 29 1.30 REFRIGERANTS
30
31 A. Chlorofluorocarbons (CFCs) and Hydrochlorofluorocarbons (HCFCs) shall not be allowed in
32 any equipment on this project.
33
34 B. Comply with ASHRAE Standards 15 and 34.
35
- 36 1.31 REFRIGERANT RECOVERY AND RECYCLE
37
38 A. Refrigerants shall not be released to the environment.
39
40 B. Contractor shall provide recovery and recycle equipment that has been certified by the
41 Electrical Testing Laboratories or Underwriters Laboratories.
42
43 C. Contractor shall also provide properly trained and certified (in accordance with EPA) personnel
44 for refrigerant work during installation, demolition, start-up, servicing, etc.
45
- 46 1.32 ACCESS CLEARANCE
47
48 A. Proper access to all installed equipment shall be provided. The Mechanical Contractor shall
49 label all points of access immediately upon installation with a marker pen.
50
51 B. A minimum of 3 feet shall be maintained in front of all access points.
52
53 C. If another trade violates this space, the Mechanical Contractor shall immediately notify the
54 General Contractor to correct this condition.
55

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- 1 D. When equipment is installed above lay-in ceiling the Mechanical Contractor shall coordinate
- 2 with the Ceiling Contractor to provide access without removing part of T-bar ceiling.
- 3
- 4 E. No speakers, lights, fire alarm equipment, etc. shall be installed in lay-in ceiling tiles where
- 5 access is to be gained.
- 6
- 7

8 **PART 2 PRODUCTS**

- 9
- 10 A. Not Applicable
- 11
- 12

13 **PART 3 EXECUTION**

14 **3.1 TESTING**

- 15
- 16
- 17 A. After all mechanical systems have been completed and put into operation, subject each
- 18 system to an operating test under design conditions to ensure proper sequence and operation
- 19 throughout the range of operation regardless of the season the contractor shall test all HVAC
- 20 equipment in both heating and cooling modes.
- 21
- 22 B. Each and every phase of the new air conditioning, heating and ventilating systems shall be
- 23 operated separately, or in conjunction with the other, for a period of time, to demonstrate to
- 24 the satisfaction of the A/E the ability of the equipment to meet the capacity and performance
- 25 requirements while maintaining design conditions in accordance with the true intent and
- 26 purpose of these specifications.
- 27
- 28 C. Previous to such performance tests, the Contractor shall have set all valves, dampers, motors,
- 29 controllers, thermostats, etc., and shall have the system operating and maintaining design
- 30 temperatures, humidity and air circulation throughout all areas of the building.
- 31
- 32 D. Make adjustments as required to ensure proper functioning of all systems.
- 33
- 34 E. Special tests on individual systems are specified under individual sections.
- 35
- 36 F. See Section 23 05 93 for Testing, Adjusting, and Balancing for HVAC.
- 37

38 **END OF SECTION**

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SECTION 23 00 90

HVAC SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. This section supplements Division 01 Submittal Procedures and contains additional requirements applicable to Division 23 submittals.

1.2 SECTION INCLUDES

A. This section includes, but is not limited to:
1. HVAC submittal procedures
2. List of required Division 23 submittals to the engineer
3. This section applies only to the Division 23 specifications. Submittals required by other specification divisions are not included here, even though the same subcontractor may be providing work under other divisions.

1.3 RELATED SECTION

A. Division 01 - Submittal Procedures

1.4 DEFINITIONS

- A. Product Data: Illustrations, standard schedules, performance charts, instructions, and brochures furnished by the contractor, subcontractor, manufacturer, or supplier to illustrate materials or equipment or to illustrate some portion of the work. Provide a summary of scheduled items with all data in schedules.
- B. Shop Drawings: Drawings, diagrams, schedules and other data specifically prepared for the work by the contractor, subcontractor, manufacturer, or supplier to illustrate some portion of the work.
- C. Equipment/Material Submittal Package: A compilation of the product data, shop drawings, and other items as required by the specifications, submitted near the start of the work. Typically, the specifications require the initial submittal package to be submitted within a certain number of days after the work starts.
- D. Quality Assurance Submittal: Items submitted before and during the execution of a particular portion of the work for the purpose of guarding against defects and deficiencies.
- E. Quality Control Submittal: Items submitted at the completion of a particular portion of the work for the purpose of evaluating completed activities and elements of the work for conformance with contract requirements (e.g. start-up reports).
- F. Closeout Submittals: Items submitted at or near the completion of the contract.

1.5 SUBMITTALS

A. The materials, workmanship, design, and arrangement of all work installed under this contract shall be subject to the review of the architect, engineer and owner.

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- 1 B. Manufacturers: Manufacturers submitted shall be as per the acceptable manufacturers listed
2 in each specification section or referenced schedule. For additional manufacturers requiring
3 approval, reference the Substitution of Products article in Section 23 00 00.
4
- 5 C. Required Submittals: Refer to the Submittals article of each individual Division 23 specification
6 section for the required items to be submitted.
7
- 8 D. Contractor's Coordination Submittals: The contractor may require his subcontractors to
9 provide drawings, setting diagrams, and similar information to help coordinate the project, but
10 such data shall remain between the contractor and his subcontractors and will not be reviewed
11 by the engineer.
12
- 13 E. Electronic Submittals: E-mail or other electronic forms of submittals from the contractor are
14 required. The procedures described in this section shall be as follows:
15 1. The contractor shall supply one electronic copy of the submittal.
16 2. The electronic files will either be e-mailed to the architect, or posted to a project
17 management and information exchange web site, depending on the architect's
18 requirements. The architect and contractor can distribute copies of the files as desired.
19 3. The engineer will retain an electronic copy of the submittal and all responses.
20
- 21 F. Coordination Correspondence: The contractor may desire to verify the acceptability of a
22 particular item prior to assembling the initial submittal package. The contractor may send
23 material directly to the engineer for comments and feedback. This communication will be
24 treated as normal coordination correspondence and will not be tracked or documented as a
25 formal submittal. The engineer may or may not respond to such correspondence. If the
26 engineer agrees, in writing, to the use of a particular item, then that same material shall be
27 included in the initial submittal package along with a copy of the correspondence.
28
- 29 G. Unapproved Products: If materials or equipment are installed before being reviewed by the
30 engineer, the contractor shall be liable for the removal and replacement of such unapproved
31 materials and equipment, at no additional expense to the owner. Additionally, if the removal
32 and replacement of rejected materials or equipment necessitates the removal and
33 replacement of other related materials or equipment, then the contractor shall be liable for the
34 removal and replacement of the related materials and equipment at no additional expense to
35 the owner.
36
- 37 H. Product Data: Where the content of manufacturer submittal literature includes data not
38 pertinent to the submittal, clearly indicate which portions of the contents are being submitted
39 for review. Catalogs, pamphlets, or other documents submitted to describe items on which
40 review is being requested shall be specific and identifications in catalog, pamphlets, etc., of
41 items submitted shall be clearly made in a contrasting ink or highlighting. Data of a general
42 nature shall not be acceptable.
43
- 44 I. Shop Drawings:
45 1. Scale and measurements: Make shop drawings accurately to a scale sufficiently large to
46 show all pertinent aspects of the item.
47 2. Electronic shop drawing submittals are required.
48
49

50 PART 2 PRODUCTS

- 51
- 52 A. Not applicable
- 53

54

55 PART 3 EXECUTION

56

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1 3.1 SUBMITTALS
2

3 A. Make submittals of product data, shop drawings, samples, quality assurance submittals,
4 quality control submittals, and other items in accordance with the requirements of this section,
5 applicable sections in Division 23, and additional requirements of each individual Division 23
6 specification section.
7

8 B. Grouping of Submittals:

9 1. The submittal package shall be coordinated and included in a single submission. Multiple
10 submissions are not acceptable except where prior written approval has been obtained
11 from the engineer. Partial submittals may be rejected, without being reviewed, as not
12 complying with the provisions of the contract.

13 2. In the case that multiple submissions are approved, it is the responsibility of the contractor
14 to maintain and update a submittal check list. The contractor shall ensure that all
15 applicable submittal sections are submitted to the Engineer. If a submittal section is not
16 submitted, it will be considered rejected until reviewed by the Engineer.

17 3. If submittal sections are submitted as individual submittal files, the submittal sections will
18 be grouped and returned as one file with one set of submittal responses.
19

20 C. Electronic Submittal Organization:

21 1. Electronic submittals are to be submitted as a single PDF file. Within the PDF file, each
22 section shall be bookmarked.

23 2. Provide an electronic submittal cover sheet that lists at least the following:

24 a. Project name

25 b. Date

26 c. Name and address of architect

27 d. Name and address of engineer

28 e. Name, address and telephone number of prime contractor

29 f. Name, address and telephone number of HVAC contractor

30 g. Name, address and telephone number of HVAC supplier

31 3. Provide an electronic index sheet listing all items submitted.

32 4. The contractor shall call to the attention of the engineer, clouded in the submittal and
33 noted after the index sheet, any instance in which the submittals are known to differ from
34 the requirements of the contract documents.

35 5. Organize all required items by specification section. The material for each specification
36 section shall be organized as follows:

37 a. Provide an electronic section cover sheet that lists the same information as the
38 submittal cover sheet, plus the specification number and title and the name, address
39 and telephone number of the vendor or vendor's representative, if applicable.

40 b. Refer to the individual Division 23 specification sections for any required
41 organization of the submittal material within each submittal section.

42 c. Bookmarked sections shall be arranged by specification section number in
43 numerical order.

44 d. Submit in accordance with these procedures and procedures described in Division
45 01 Submittal Procedures.

46 e. Submittals not organized as described here may be rejected, without being
47 reviewed, as not complying with the provisions of the contract.
48

49 D. Response to engineer's review:

50 1. Review comments: Review comments of the engineer will either be shown on the
51 returned sets to the contractor or shown on a document attached to the sets. If the
52 comments are on an attached document, then the engineer will place a note on the
53 submittal referring to the attached comments. In such cases, the engineer's signature will
54 appear only on the attached document. If the attached, signed document becomes
55 physically separated from the submittal, then the submittal will no longer be considered
56 as being a reviewed submittal.

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- 1 2. Complete rejection: If the submittal is not complete or does not meet the requirements of
- 2 this specification section, then the engineer may reject the entire submittal and return the
- 3 submittal without further review or comment. In such cases, the entire submittal shall be
- 4 completely revised and resubmitted. The resubmittal shall be given a new submittal
- 5 number and shall be documented and processed as a separate submittal from the
- 6 original.
- 7 3. Held for completion: If the submittal is not complete, but is only missing some minor item,
- 8 the engineer may, at the engineer's sole discretion, hold the submittal rather than
- 9 rejecting and returning the submittal. In such cases, the engineer will notify the architect
- 10 and contractor that the submittal is being held for completion. The contractor will be given
- 11 a predetermined amount of time to provide the missing item. Upon receipt of the missing
- 12 item, the engineer will insert the missing item into the submittal package and proceed
- 13 with the review process.
- 14 4. Partial rejection: The engineer may reject only certain portions of the submittal. In such
- 15 cases, only those rejected portions or items need to be revised and resubmitted.
- 16 5. Provide as noted and corrected: The engineer may note a required change to a submitted
- 17 item, but may not consider the change serious enough to require a resubmittal. In such
- 18 cases, the engineer will note that the item is to be provided as noted or corrected. In such
- 19 cases, the contractor may proceed to provide the item. However, if subsequent
- 20 observations reveal that the noted change was not made, then the contractor shall be
- 21 liable for removal and replacement of the item at no additional cost to the owner.
- 22 6. Reviewed without comment: The contractor may proceed to provide all materials and
- 23 equipment as submitted.

- 24
- 25 E. Close-out Submittals:
- 26 1. Provide close-out submittals in accordance with the requirements of Division 1.
- 27

END OF SECTION

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SECTION 23 05 19

METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 23 00 00, apply to this Section.

1.2 SECTION INCLUDES

- A. Thermometers
- B. Pressure gauges
- C. Flow meters
- D. Pete's plugs

1.3 RELATED SECTIONS

- A. Section 22 05 30 - Pipe and Pipe Fittings - General
- B. Section 23 00 00 - Basic Mechanical Requirements
- C. Section 23 05 93 - Testing, Adjusting and Balancing for HVAC
- D. Section 23 21 13 - Hydronic Piping, Valves, and Appurtenances
- E. Section 23 21 23 - Hydronic Pumps
- F. Section 23 33 33 - Access Doors
- G. Section 23 52 33 - Water Tube Boilers

1.4 SUBMITTALS

- A. Provide submittal data on all items specified in this section in accordance with Specification Section 23 00 90, General Conditions, and Division 01.

PART 2 PRODUCTS

2.1 THERMOMETERS

- A. Type:
 - 1. 9" adjustable angle thermometer
- B. Construction:
 - 1. Temperature range:
 - a. Fahrenheit degrees as approved by the Engineer.
 - 2. Window:
 - a. Unbreakable, Heat resistant Acrylic.

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- 1 3. Furnish with separable socket.
- 2 4. Manufacturer/Model:
- 3 a. Terice
- 4 b. MILJOCO

5
6 2.2 PRESSURE GAUGES

- 7
- 8 A. Type:
- 9 1. 4" dial type pressure gauge
- 10
- 11 B. Manufacturer/Model:
- 12 1. Terice
- 13 2. MILJOCO
- 14
- 15 C. Construction:
- 16 1. Pressure range:
- 17 a. PSI as approved by Engineer.
- 18 2. Cast aluminum case
- 19 3. Double strength clear glass window
- 20 4. Stainless steel movement
- 21 5. Phosphor bronze tube with brass socket
- 22 6. Furnish with a quarter turn lever handle gauge cock.
- 23 7. Accuracy:
- 24 a. 1% of scale range.
- 25

26 2.3 CHILLED/ HOT WATER FLOW METERS

- 27
- 28 A. Type:
- 29 1. Dual turbine flow meter
- 30
- 31 B. Manufacturer:
- 32 1. ONICON Model F-1200
- 33
- 34 C. Construction:
- 35 1. Two contra-rotating axial turbines with electronic impedance-based sensing, and an
- 36 averaging circuit to reduce measurement errors due to swirl and flow profile distortion.
- 37 2. Output signal 0-15V
- 38 3. Accuracy:
- 39 a. $\pm 0.5\%$ of rate at calibrated velocity
- 40 b. $\pm 1.0\%$ of rate over a 10:1 turndown
- 41 c. $\pm 2.0\%$ of rate over a 50:1 turndown
- 42

43 2.4 CONDENSER WATER FLOW METERS

- 44
- 45 A. Type:
- 46 1. Insertion electromagnetic flow meter
- 47
- 48 B. Manufacturer:
- 49 1. ONICON Model F-3500
- 50
- 51 C. Construction:
- 52 1. Wetted metal components to be 316SS.
- 53 2. Meter shall average velocity readings from two sets of diametrically opposed electrodes
- 54 3. Output signal 0-10V
- 55 4. Accuracy:
- 56 a. $\pm 1.0\%$ of rate from 2-20ft/s

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- 1 2.5 PETE'S PLUGS
- 2
- 3 A. Provide two sets of suitable pressure and temperature gauges for use with the plugs.
- 4

5
6 PART 3 EXECUTION

7
8 3.1 INSTALLATION

- 9
- 10 A. Furnish and install thermometers, pressure gauges and Pete's plugs where indicated on
- 11 plans in accordance with manufacturer's instructions.
- 12
- 13 B. Install thermometers at each pump, and on the return water piping of chilled water and hot
- 14 water systems.
- 15
- 16 C. Install pressure gages across each pump.
- 17
- 18 D. Flow meters shall be installed per manufacturer's instructions. Particular attention to be paid
- 19 to upstream and downstream straight pipe runs. Coordinate exact installation location with
- 20 engineer.
- 21
- 22 E. Provide 10 extra Pete's plugs as located by test and balance and controls companies.
- 23

24 END OF SECTION

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SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 23 00 00, apply to this Section.

1.2 SECTION INCLUDES

- A. Isolation pads
- B. Concrete bases
- C. Expansion joints
- D. Chilled water, Hot water, and Refrigerant Piping supports
- E. Other supports

1.3 RELATED SECTIONS

- A. Section 23 00 00 - Basic Mechanical Requirements
- B. Section 23 21 23 - Hydronic Pumps
- C. Section 23 31 13 - Metal Ductwork
- D. Section 23 52 33 - Water Tube Boilers

1.4 SUBMITTALS

- A. Product Data:
 - 1. Provide submittal data on all items specified in this section in accordance with Section 23 00 90, General Conditions, and Division 1.
 - 2. Submit shop drawings and catalog data with locations of use.

1.5 REFERENCES

- A. Refer to Section 23 00 00 for complete names of references identified in this section.
- B. SMACNA Standards
- C. ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers

1.6 QUALITY ASSURANCE

- A. Isolation devices must be provided by a company whose sole business is to provide isolation equipment.
- B. All equipment and materials to be installed in workmanlike manner by experienced mechanics and as recommended by the manufacturers.

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- 1 C. Design Data: Complete design of isolation equipment including confirmation that no noise will
2 be transmitted to structure of building.
3
4
- 5 PART 2 PRODUCTS
6
- 7 2.1 GENERAL
8
- 9 A. Provide isolation and support devices as required for all mechanical equipment.
10
- 11 2.2 MANUFACTURERS
12
- 13 A. Amber/Booth
14
- 15 B. Anvil
16
- 17 C. Kenetics
18
- 19 D. Korfund Vibration Mountings
20
- 21 E. Mason
22
- 23 F. Peabody
24
- 25 G. Vibro Acoustics
26
- 27 2.3 CONDENSING UNIT ISOLATION
28
- 29 A. Provide isolation pad between unit and structure as shown on plans.
30
- 31 2.4 FLEXIBLE DUCT CONNECTIONS
32
- 33 A. Use "Ventglas" fabric, fireproof, waterproof, and mildew resistant, approximately 30 ounces
34 per square yard.
35
- 36 B. Comply with SMACNA standards.
37
- 38 2.5 BASE MOUNTED PUMP ISOLATION
39
- 40 A. Provide isolation pads per manufacturer's recommendations or as detailed on plans.
41
- 42 B. Provide vibration isolation expansion joints at all inlets and outlets of pumps.
43
- 44 2.6 ISOLATION FOR AIR HANDLERS ABOVE 5 TONS
45
- 46 A. Spring isolators:
47 1. Type:
48 a. Open stable steel spring type with a minimum deflection of one inch.
49
- 50 B. Concrete Pad:
51 1. Type:
52 a. 5 inch housekeeping pad
53

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1 2.7 HVAC PIPE SUPPORTS
2

3 A. Hangers:

- 4 1. All Copper Piping
5 a. Copper plated ferrous hangers.
6 2. 2" and smaller piping in walls:
7 a. May be split cast ring type with fastening device in walls and chases.
8 3. All Other Above Ceiling Locations:
9 a. Adjustable clevis type. Hangers to accommodate circumference of pipe and saddles.

10
11 B. Hanger Rods:

- 12 1. Type:
13 a. Minimum 3/8 inch diameter with machine threads.
14

15 C. Minimum Steel Hanger Rod Diameter for Individually Suspended Horizontal Pipes:

- 16 1. 2" and smaller diameter pipe:
17 a. 3/8"
18 2. 2-1/2" to 3-1/2" diameter pipe:
19 a. 1/2"
20 3. 4" to 5" diameter pipe:
21 a. 5/8"
22 4. 6" diameter pipe or larger:
23 a. 3/4"
24

25 2.8 SLEEVES
26

27 A. Application:

- 28 1. Provide sleeves for all pipes and conduits which pass through a concrete slab, masonry
29 wall/concrete wall, roof or other portion of the building structure.
30

31 B. Above Grade and/or dry locations:

- 32 1. Material:
33 a. 20 or 22 gauge galvanized steel.
34 2. Size:
35 a. As necessary to allow free passage of the insulated pipe.
36

37 C. Passing through fire-rated enclosures:

- 38 1. Material:
39 a. Galvanized or black steel pipe.
40 b. Non-combustible.
41 c. PVC will not be allowed.
42
43

44 PART 3 EXECUTION
45

46 3.1 ISOLATION DEVICES AND PAD INSTALLATION
47

- 48 A. Install isolation pads between floor and equipment pads according to manufacturer's
49 recommendations and approved shop drawings.
50
51 B. Install flexible duct connections where ducts connect to fans or air handling units.
52
53 C. All joints to be airtight.
54
55 D. Provide a minimum of 1/2" slack in connections, and a minimum of 2½" distance between the
56 edges of ducts.

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- 1 E. Comply with recommendations of ASHRAE for the selection and application of vibration
2 materials and units.
3

4 3.2 SECURING AND SUPPORTING OF HVAC PIPING
5

- 6 A. Support all pipe from the building structure by means of approved hangers and supports while
7 maintaining required grade and pitch, preventing vibration and providing for expansion and
8 contraction.
9

- 10 B. Secure all hangers to approved inserts wherever possible.

- 11 C. Set hanger inserts in place when the concrete is poured.
12

- 13 D. If Joists Are Used for Attachment:
14

- 15 1. 2" diameter or smaller:

- 16 a. May be attached to the bottom of joists.

- 17 2. Greater than 2" diameter:

- 18 a. Must be attached to the top cord of the joists.

- 19 3. Do not support any piping and trapeze hangers from joist bridging on roof and floor deck.
20

- 21 E. If Structural Steel Framing Is Used for Attachment:

- 22 1. Use approved beam clamps.

- 23 2. Where required, install channels to span between framing members.

- 24 3. Do not attach hangers to the roof deck or cross bracing.
25

- 26 F. Hanger Spacing:

- 27 1. Schedule 40 Black Steel Piping (Chilled water/ Hot water piping):

- 28 a. 1/2" diameter pipe → 6'-0" or less

- 29 b. 3/4" diameter pipe → 8'-0" or less

- 30 c. 1-1/4" diameter pipe → 10'-0" or less

- 31 d. Vertical:

- 32 (1) Every Floor Level Minimum

- 33 (2) Adequately support at their bases, either by a suitable hanger placed in the
34 horizontal line near the riser, or by a base fitting set on a pedestal or foundation.

- 35 (3) Support from each floor slab by means of an approved clamp-type support
36 which bears on the slab or beam.

- 37 2. Copper Piping (Refrigerant Piping):

- 38 a. Smaller Than 1 1/4" → 6'-0" or less

- 39 b. 1 1/2" and Larger → 10'-0" or less

- 40 c. Vertical → 10'-0" or less
41

- 42 G. Change of Direction:

- 43 1. Install supports within two feet of change of direction.

- 44 2. Brackets of approved type may be used along the walls.

- 45 3. Install hangers within 2 feet of each change in vertical or horizontal direction, pipe tees
46 and on each side of valves, strainers, etc.

- 47 4. Multiple horizontal pipes, smaller than 12" diameter pipe, may be supported on trapeze
48 hangers. Space trapeze hangers in accordance with the schedule for pipe spacing based
49 upon the smallest size pipe.

- 50 5. Properly size the trapeze members for the piping load they are to support. The number
51 of pipes on the trapeze must be approved by the Engineer to prevent overloading of the
52 building structure.

- 53 6. Where pipes are insulated, oversize the hanger accordingly to accommodate the outside
54 diameter of the insulation. Provide half-round 16 gauge galvanized steel shields, not less
55 than 12" long and rolled to fit the insulation diameter, between the insulation and the
56 hanger.

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- 1 7. When pipe is guided at top and bottom, cover the entire pipe circumference with metal
- 2 shields.
- 3 8. Adhere metal shield to the insulation so that the metal will not slide with respect to the
- 4 insulation.
- 5 9. Wood struts shall not be used to support piping in walls.
- 6

7 3.3 SLEEVES

8

9 A. Above Grade and/or Dry Locations:

10 1. Walls:

- 11 a. Mount flush on both sides.

12 2. Floors:

- 13 a. Mount 2 inches above finished floor in pipe chases.
- 14

15 B. Passing Through Fire-Rated Enclosure:

- 16 1. Fill the void space around the pipe in accordance with NFPA requirements.

- 17 2. Do not allow the sleeve installation to lower the fire rating of the assembly.
- 18
- 19

END OF SECTION

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SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 23 00 00, apply to this Section.

1.2 SECTION INCLUDES

- A. Identification required for mechanical systems.
- B. Code required identification not shown on plans nor specified herein shall be provided.

1.3 RELATED SECTION

- A. Section 23 00 00 - Basic Mechanical Requirements

1.4 SUBMITTALS

- A. Provide submittal data on all items specified in this section in accordance with Specification Section 23 00 90, General Conditions, and Division 01.
- B. Submit wording of nameplates with submittals.
- C. Submit list of all products incorporated in this section.

1.5 REFERENCES

- A. Comply with ANSI A13.1
- B. USAS Code B31.8
- C. NTSB-PSS-73-1
- D. AGA

1.6 DESCRIPTION OF WORK

- A. Nameplates and tags are to be provided for all mechanical equipment and piping in the project. Identification is also required for the following, but is not limited to:
 - 1. Air Handlers
 - 2. Boilers/Water Heaters
 - 3. Condensing Units
 - 4. Duct Dampers
 - 5. Filter Sizes for Air Handlers
 - 6. Fire Dampers
 - 7. Heat Exchangers
 - 8. Outside Air Units
 - 9. Piping
 - 10. Pumps
 - 11. Starters

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- 1 12. Supply/Exhaust Fans
- 2 13. Valves
- 3
- 4
- 5 PART 2 PRODUCTS
- 6
- 7 2.1 MANUFACTURERS
- 8
- 9 A. Seton
- 10
- 11 B. Brady
- 12
- 13 C. MSI
- 14
- 15 2.2 EQUIPMENT LABELS
- 16
- 17 A. Type: Engraving-Stock, melamine plastic laminate, 3 layer.
- 18 1. Thickness:
- 19 a. Less than 25 square inches: 1/16 inch
- 20 b. 25 square inches or more: 1/8 inch
- 21
- 22 B. Color:
- 23 1. Black
- 24
- 25 C. Conform to FS L-P-387A
- 26
- 27 2.3 LETTERING
- 28
- 29 A. Style:
- 30 1. Engraved standard print.
- 31
- 32 B. Size:
- 33 1. 3/16 inch to 1/4 inch
- 34
- 35 C. Color:
- 36 1. White letters, black background
- 37
- 38 2.4 NAMEPLATE/TAG INFORMATION
- 39
- 40 A. HVAC Equipment:
- 41 1. Unit mark from Drawings/Owner
- 42 2. Voltage - Phase
- 43 3. Manufacturer and Model Number
- 44 4. Filter size
- 45
- 46 2.5 NAMEPLATE FASTENERS
- 47
- 48 A. Securely attach nameplates to equipment with non-corroding stainless steel screws.
- 49
- 50 B. Non-corroding pop rivets are acceptable.
- 51
- 52 C. Stick-ons or adhesives will not be allowed.
- 53

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1 2.6 PIPING AND CONTROL DIAGRAM SIGNS
2

- 3 A. Material: 1/4 inch acrylic cover and backing screwed together with brass screw/bolts.
4 1. Size:
5 a. Minimum: 12" x 17"
6 b. Maximum: 24" x 36"
7
8 B. Provide a diagram in each mechanical room similar to the diagrams shown on the plans,
9 and/or as required for the area served. This diagram to reflect as built conditions.
10

11 2.7 IDENTIFICATION OF PRODUCTS
12

- 13 A. Provide pipe markers with the following features.
14 1. Letters from 1/2" to 3-1/2"; size letters to afford readability from the appropriate viewing
15 position.
16 2. Repeated and reversed words for viewing from 360° around pipe.
17 3. Self-clinging, coiled markers that snap into place around pipe and do not require any
18 other securement.
19 4. Integral directional arrows.
20
21 B. Letters on Field:
22 1. Identify the specific material conveyed. (i.e. "Domestic Cold Water", "Sprinkler", etc.)
23
24 C. Model:
25 1. Less than 3/4":
26 a. Tags: Piping System Devices, color codes for hazard.
27 2. 3/4" up to 6"; snap-on.
28 3. Over 6"; strap-on, with stainless steel spring straps.
29 4. Use tags and/or nameplates that are scratch resistant and UV resistant for outdoor
30 equipment and piping.
31
32 D. Piping System Devices (Valves, Thermometers, Pressure Gages, etc., and Pipe Less Than
33 3/4"):
34 1. Identify with the following:
35 a. Tags:
36 (1) Not less than 1-1/2 inch brass or aluminum tags, round, square, or octagonal.
37 b. Stamp tags with minimum 1/2" high descriptive characters, 1/2" high numbers with
38 black enamel-filled indentations.
39
40 E. Attachment:
41 1. Stainless steel or solid brass jack chain, or stainless steel or brass "S" hooks
42
43 F. Ductwork:
44 1. Stenciled letters or self-adhesive labels, minimum 1" high characters.
45 2. Red ribbon at each balancing damper.
46
47 G. Underground Warning Tapes:
48 1. Provide materials that meet the codes or have the approvals listed below:
49 a. Office of Pipeline Safety Regulation, USAS Code B31.8.
50 b. GSA Public Building Service Guide Specification.
51 c. National Transportation Safety Board Report NTSB-PSS-73-1.
52 d. AGA Report 72-D-56.
53 e. API Report API RP 1109.
54 2. Material:
55 a. Plastic, continuous tape, color-coded, marked for hazard.

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- 1 b. For Non-metallic Piping System:
2 (1) Aluminum foil core encased in plastic.
3 c. Metallic Piping:
4 (1) Plastic tape.
5 3. Color:
6 a. Colored (not printed color) plastic, coded for material conveyed by piping.
7 4. Width:
8 a. As scheduled for piping system burial depth.
9 5. Legend:
10 a. "Caution [System Name] Line Buried Below".
11 6. Tape Colors:
12

Utility	Color
Natural Gas, Oil, Dangerous Materials	Hi Visibility Safety Yellow
Communications	Safety Alert Orange

13 7. Model:
14 a. Metallic Piping System:
15 (1) Polyethylene Tape.
16 b. Non-Metallic Piping System:
17 (1) Metallic Detection Tape.
18
19
20
21 H. Underground Gas Piping:
22 1. Attach No. 18 gauge copper tracer wire to the piping and terminate above grade at each
23 end.
24
25 I. Pipeline Markers for Pipe Beneath Pavement and Slabs:
26 1. Minimum 2" round, square, or octagonal, same as specified in Subparagraph: Piping
27 System Devices.
28
29 J. Attachment:
30 1. 1-1/2" screw, bolted to tag as anchor.
31 2. Anchor Setting Compound:
32 a. Epoxy or epoxy grout, compatible with the pavement.
33
34

35 PART 3 EXECUTION

36
37 3.1 GENERAL

- 38
39 A. Contractor shall verify room numbers with Owner/Engineer before nameplates are fabricated.
40
41 B. The following shall be permanently and clearly identified:
42 1. Each air handler, condensing unit, compressor, exhaust fan, and pump.
43 2. Each zone duct, outside air duct, and return air duct whose duty is not immediately
44 apparent.
45 3. Each valve whose service and/or duty is not immediately apparent.
46

47 3.2 INSTALLATION

- 48
49 A. Install signs on non-removable panels. Attach to equipment with pop rivets or stainless steel
50 screws.
51
52 B. Mount in an easily visible location.
53
54 C. All labeling identification shall conform to final room numbers. Coordinate with General
55 Contractor, A/E and Owner to secure construction room numbers.
56

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- 1 D. Provide all additional signage required by local authority at no cost to the Owner.
2
3 E. Provide filter sizes and quantity on all air handlers.
4
5 F. Complete installation in accordance with ANSI A13.1 and manufacturer's installation
6 instructions and with the Drawings. Fasten each unit securely in place with stainless steel
7 screws.
8
9 G. Equipment Labeling:
10 1. Install on scheduled items of equipment, including the following:
11 a. Air conditioning equipment
12 b. Pumps
13 c. Control panels and major control components
14 d. Include Mark Number and descriptive name from Drawing and Specification
15 schedules
16 e. Attach with corrosion resistant, stainless steel screws or pop rivets
17 f. Install 1/2" diameter adhesive marker (color to be approved by A/E), and apply to T-
18 bar below any mechanical equipment and fire dampers above lay-in ceiling.
19
20 H. Piping System Color Coding:
21 1. Designate for painter the following:
22 a. Types of piping services
23 b. Direction of flow
24 c. Other information required for proper identification.
25
26 I. Surfaces to be Painted:
27 1. Bare piping
28 2. Insulation covering of insulated piping
29
30 J. Paint according to the following schedule:
31

	Pastel
System	Color
Condenser Water	Green
Gas Piping on Roof	Black or as required by local authority having jurisdiction

32
33
34
35
36 K. Piping System Devices (Valves, Thermometers, Pressure Gages, etc.):
37 1. Identify with the following information:
38 a. System
39 b. Device number
40 c. Device Function
41
42 L. Device Chart:
43 1. Key devices to device chart
44 2. Give complete description of device function and system.
45
46 M. Key devices to drawings as follows:
47 1. Floor plans
48 2. Schematic drawings of piping systems
49

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1 N. Underground Warning Tapes:

2 1. Tape Widths:

3	Piping Burial	Depth Tape Width
4	10"	2"
5	20"	3"
6	27"	6"
7	30"	9"
8	40"	12"
9	50" or more	18"

10
11 O. Recommended Tape Bury Depth:

12 1. Minimum Depth:

13 a. 6".

14 2. Distance Between Pipe and Tape:

15 a. Minimum 12".

16 b. Maximum Depth: 12".

17 3. Tie tape to pipe where pipe leaves the ground.

18

19 P. Pipeline Markers for Pipe Beneath Pavement and Slabs.

20 1. Location:

21 a. Accuracy:

22 (1) Plus or minus 6" from piping centerline.

23 b. Flat Edge Pavement and Slabs:

24 (1) Set within 6" of pavement or slab edge.

25 c. Concrete Curbs:

26 (1) Set in top of curb.

27 d. Spacing:

28 (1) Each change in direction, each edge of pavement or slab, maximum spacing
29 of 100'.

30 2. Legend:

31 a. Same as tags plus an engraved or stamped line; set marker with line parallel to
32 buried line.

33 3. Attachment:

34 a. Drill hole for anchor bolt, full depth of bolt plus 1/2"; set full tag and bolt in epoxy,
35 flush with pavement or slab.

36

37

END OF SECTION

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
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SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 23 00 00, apply to this Section.

1.2 SECTION INCLUDES

- A. Testing and balancing services for the heating, ventilating, and air conditioning (HVAC) systems of this project.
- B. The testing and balancing agency will be responsible for the satisfactory execution of testing and balancing of the HVAC systems.
- C. The following are acceptable agencies:
 - 1. Complete System Balance
 - 2. Delta-T, Inc.
 - 3. Engineered Air Balance
 - 4. PHI Service Agency, Inc.
 - 5. Air Balancing Company, Inc.
 - 6. Elite Test and Balance, LLC

1.3 RELATED SECTIONS

- A. Section 23 00 00 - Basic Mechanical Requirements
- B. Section 23 07 13 - Duct and Grille Insulation
- C. Section 23 21 23 - Hydronic Pumps
- D. Section 23 52 33 - Water Tube Boilers

1.4 STANDARDS

- A. The balancing agency shall perform the services specified herein in accordance with the Associated Air Balance Council's National Standards, including revisions, to the date of the contract.
- B. All terms in this specification shall have their meaning defined as stated in the National Standards.
- C. If these specifications set forth more stringent requirements than the AABC National Standards, these specifications shall prevail.

1.5 QUALIFICATIONS OF THE BALANCING AGENCY

- A. The balancing agency shall be a member of the Associated Air Balance Council (AABC) and/or certified by the National Environmental Balancing Bureau (NEBB).

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- 1 B. To perform required professional services, the balancing agency shall have a minimum of one
2 "Test and Balance Engineer" certified by the Associated Air Balance Council and/or the
3 National Environmental Balancing Bureau (NEBB).
4
- 5 C. This certified "Test and Balance Engineer" shall be responsible for supervision and
6 certification for the total work herein specified.
7
- 8 D. The balancing agency shall submit records of experience in the field of air and hydronic system
9 balancing or any other data as requested by the Owner/Engineer. The supervisory personnel
10 for the firm shall have at least five (5) years' experience, and be a full time employee for a
11 minimum of six (6) months prior to the project. All employees used in this project shall be
12 qualified technicians in this specific field.
13
- 14 E. The balancing agency shall furnish all necessary calibrated instrumentation to adequately
15 perform the specified services. An inventory of all instruments and devices in possession of
16 the balancing agency may be required by the Owner to determine the balancing agency's
17 performance capability.
18
- 19 F. The balancing agency shall have operated for a minimum of five (5) years under its current
20 name.
21

22 1.6 DOCUMENTS

- 23 A. The General Contractor will provide the balancing agency one copy of the following
24 documents:
25 1. Project drawings (mechanical sepias if requested) and specifications.
26 2. Reviewed construction revisions pertaining to the HVAC systems.
27 3. Reviewed submittal data on HVAC equipment and systems to be installed by the
28 Mechanical Subcontractor.
29 4. Reviewed HVAC shop drawings.
30 5. Reviewed HVAC wiring diagrams, control diagrams, and equipment brochures, as
31 appropriate.
32

33 34 1.7 COORDINATION

- 35 A. It will be necessary for the balancing agency to perform its services in close coordination with
36 the Mechanical Subcontractor.
37
- 38 B. The plans and specifications indicate meters, valves, dampers, and other devices for the
39 purpose of adjusting the system to obtain optimum operating conditions. It will be the
40 responsibility of the Mechanical Subcontractor to install these devices in a manner that will
41 leave them accessible, readily adjustable and complete. The balancing agency shall provide
42 guidance if there is a questionable arrangement of a control or balancing device.
43
- 44 C. The General Contractor, Mechanical Contractor, Temperature Controls Subcontractor, and
45 the suppliers of the HVAC equipment shall all cooperate with the balancing agency to provide
46 all necessary data on the design and proper application of the system components. In addition,
47 they shall furnish all labor and materials required to eliminate any system deficiencies.
48

49 50 1.8 RESPONSIBILITIES OF THE MECHANICAL CONTRACTOR

- 51 A. The Mechanical Contractor shall complete the installation and start all HVAC systems to
52 ensure they are working properly, and shall perform all other items as described hereinafter
53 to assist the balancing agency in performing the testing and balancing of the HVAC systems.
54

55

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- 1 B. Air Distribution Systems:
 - 2 1. Verify installation for conformity to design.
 - 3 2. Terminate all supply, return, and exhaust ducts, and pressure test them, for leakage, as
 - 4 required by specification.
 - 5 3. Ensure that all splitters, extractors, and volume and fire dampers are properly located
 - 6 and functional. Dampers serving requirements of minimum and maximum outside, return,
 - 7 relief, and exhaust air shall provide tight closure and full opening, with a smooth and free
 - 8 operation.
 - 9 4. Verify that all supply, return, exhaust, and transfer grilles; registers; diffusers; and high-
 - 10 pressure terminal units are installed and operational.
 - 11 5. Ensure that air-handling systems, units, and associated apparatus, such as heating and
 - 12 cooling coils, filter sections, access doors, etc., are blanked and/or sealed to eliminate
 - 13 excessive bypass or leakage of air.
 - 14 6. Ensure that all fans (supply, return, relief, and exhaust) are operating and free of
 - 15 vibration. All fans and drives shall be checked for proper fan rotation and belt tension.
 - 16 Overload protection shall be of proper size and rating. A record of motor current and
 - 17 voltage shall be made to verify that the motors do not exceed nameplate rating.
 - 18 7. Make any necessary changes to the sheaves, belts, and dampers, as required by the
 - 19 balancing agency, at no additional cost to the Owner.
 - 20 8. Install clean filters.

- 21
- 22 C. Water Circulating Systems:
 - 23 1. Verify installation for conformity to design.
 - 24 2. Check all pumps to verify pump alignment and rotation.
 - 25 3. Ensure that systems are clean, with the proper strainer screens installed for normal
 - 26 operation.
 - 27 4. Check all pump motors for current and voltage, to ensure that motors do not exceed
 - 28 nameplate rating.
 - 29 5. Verify electrical overload protection of proper size and rating.
 - 30 6. Ensure that all water circulating systems shall be full and free of air; that expansion tanks
 - 31 are set for proper water level; and that all air vents were installed at high points of systems
 - 32 and are operating.
 - 33 7. Check and set operating temperatures of heat exchangers to design requirements.

34
35 1.9 RESPONSIBILITIES OF THE TEMPERATURE CONTROLS CONTRACTOR

- 36
- 37 A. The Temperature-Controls Contractor shall allow sufficient time in the project to provide
- 38 assistance and instruction to the balancing agency in the proper use and setting of control
- 39 components such as, but not limited to, computers, static pressure controllers, or any other
- 40 device that may need set points changed so that the testing and balancing work can be
- 41 performed.
- 42
- 43 B. Furnish to the balancing agency any software and cables required to make adjustments to
- 44 controls. Any unique micro-processor required to set controls shall be furnished by
- 45 Temperature Controls Contractor.
- 46
- 47 C. The Temperature Controls Contractor shall complete the installation of the temperature control
- 48 system, and operate and test all control systems to ensure they are functioning properly as
- 49 designed. The Temperature Controls Contractor shall assist the balancing agency in testing
- 50 and balancing the HVAC systems, as described hereinafter.
 - 51 1. Verify that all control components are installed in accordance with project requirements
 - 52 and are functional, including all electrical interlocks, damper sequences, air and water
 - 53 reset, and fire and freeze-stats.
 - 54 2. Verify that all controlling instruments are calibrated and set for design operating
 - 55 conditions.

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1 3. Calibrate room thermostats/sensors after installation, and before the thermostat control
2 verification tests are performed. The balancing agency shall prove the accuracy of final
3 settings by taking temperature readings. The readings shall be in a typical conditioned
4 space for each separately controlled zone.
5

6 1.10 PRE-BALANCING CONFERENCE
7

8 A. Prior to beginning of the testing, adjusting and balancing procedures, schedule and conduct a
9 conference with the Architect/Engineer, General Contractor, Mechanical Contractor, Electrical
10 Contractor and Temperature Controls Contractor. The objective of the conference is final
11 coordination and verification of system operation and readiness for testing, adjusting, and
12 balancing.
13

14 1.11 NOTIFICATION FOR TESTING AND BALANCING WORK TO BEGIN
15

16 A. The general contractor shall notify the balancing agency in writing when all heating, ventilating,
17 and air conditioning systems are complete and ready for testing and balancing. The
18 Mechanical Contractor shall attest that he has completed all items as described in
19 "RESPONSIBILITIES OF THE MECHANICAL CONTRACTOR" Section of these
20 specifications.
21

22 B. If, upon commencing the work, the balancing agency finds that the systems are not ready, or
23 if a dispute occurs as to the readiness of the systems, the balancing agency shall request an
24 inspection to be made by the Mechanical Engineer. This inspection shall establish to the
25 satisfaction of the represented parties whether or not the systems meet the basic requirements
26 for testing and balancing. Should the inspection reveal the notification to have been premature,
27 the balancing agency shall be reimbursed for all costs for the inspection and work previously
28 accomplished. Furthermore, such items that are not ready for testing and balancing shall be
29 completed and placed in operational readiness before testing and balancing services shall
30 again be requested.
31

32
33 PART 2 PRODUCTS
34

35 A. Not Applicable
36
37

38 PART 3 EXECUTION
39

40 3.1 SCOPE
41

42 A. In accordance with Project Drawings and Specifications and as specified herein, the balancing
43 agency shall provide all supervision, personnel, instruments, calibration equipment, and all
44 other materials and services necessary to perform all testing and balancing of the heating,
45 ventilating, and air conditioning systems. All test data including all pertinent calculations shall
46 be reported on appropriate forms.
47

48 3.2 GENERAL
49

50 A. The testing and balancing of the heating, ventilating, and air conditioning systems shall be
51 performed by an independent balancing agency approved by the Engineer. The balancing
52 agency shall have a minimum of five years specialized experience in air and hydronic system
53 balancing, possess calibrated instruments, certified "Test and Balance Engineers", and skilled
54 technicians to perform all required tests. The balancing agency shall be a certified member of
55 the Associated Air Balance Council and/or the National Environmental Balancing Bureau
56 (NEBB).

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- 1 B. The tests shall demonstrate the specified capacities and operation of all equipment and
2 materials comprising the systems. The balancing agency shall then make available to the
3 Owner's representative such instruments and technicians as are required for spot checks of
4 the system.
- 5
- 6 C. The balancing agency shall not instruct or direct the Mechanical Contractor in any of the work.
7 Any proposed changes or revision in the work shall be submitted to the Architect and General
8 Contractor in writing.
- 9
- 10 D. Document Review:
 - 11 1. The Test and Balance Firm shall be responsible for reviewing the HVAC plans and
12 specifications relating to the test and balance services for proper arrangement and
13 adequate provisions of devices for testing, adjusting and balancing.
 - 14 2. Test and Balance Firm shall review HVAC manufacturers' submittals data relative to
15 balanceability.
 - 16 3. Test and Balance Firm shall review submitted HVAC automatic temperature control
17 sequences for conformity to the specifications.
- 18

19 **3.3 SERVICES**

- 20
- 21 A. During construction, the balancing agency shall inspect the installation of pipe systems, sheet
22 metal work, temperature controls, and other component parts of the heating, ventilating, and
23 air conditioning systems.
- 24
- 25 B. The inspections shall be performed periodically as the work progresses. A minimum of two
26 inspections are required as follows: (1) when 60 percent of the duct work is installed; (2) when
27 90 percent of the equipment is installed. The balancing agency shall submit a brief written
28 report of each inspection to the General Contractor and Engineer.
- 29
- 30 C. Upon completion of the installation and start-up of the mechanical equipment by the
31 Mechanical Contractor, the balancing agency shall test and balance the system components
32 to obtain optimum conditions in each conditioned space in the building.
- 33

34 **3.4 DEFICIENCIES**

- 35
- 36 A. If in the process of performing the TAB work, any deficiencies encountered shall be brought
37 to the attention of the contractor responsible through defined procedures, and entered in the
38 punch list of deficiencies on the next daily Status Report. If correction of the deficiency is
39 urgent, the matter shall be brought to the attention of all involved parties for quick resolution.
40 The General Contractor shall provide and coordinate services of qualified responsible
41 subcontractors, suppliers and personnel as required to correct, repair or replace any and all
42 deficient items or conditions during the testing, adjusting and balancing period.
- 43
- 44 B. The notification may be for single or multiple deficiencies. The work necessary to correct items
45 on the listing shall be performed and verified in writing by the affected trade.
- 46
- 47 C. All deficiencies that prevent proper TAB work from being completed shall be corrected prior to
48 submittal of the Final TAB Report, unless the correction of such deficiencies cannot be
49 accomplished in a reasonable period of time, in which case the Mechanical Engineer may
50 grant permission to submit the Final TAB Report with the deficiencies detailed in the report.
- 51

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3.5 AIR SYSTEM PROCEDURES

- A. The balancing agency shall perform the following testing and balancing functions in accordance with the Associated Air Balance Council's National Standards:
 1. Fan Speeds:
 - a. **For all multistage units, low and high fan speeds must be individually set.**
 - b. Test and adjust fan RPM to achieve design CFM requirements.
 2. Current and Voltage:
 - a. Measure and record motor current and voltage.
 3. Pitot-tube Traverse:
 - a. Perform a Pitot-tube traverse of main supply and return ducts to obtain total CFM. If a Pitot-tube traverse is not practical, the summation of the outlets or inlets may be used. An explanation why a traverse was not made must appear on the appropriate data sheet.
 4. Outside Air:
 - a. Test and adjust system minimum outside air by Pitot-tube traverse. If a Pitot-tube traverse is not practical, the percentage of outside air may be determined by calculations from the return air, outside air, and mixed air temperatures. Make allowances for heat of compression and motor heat where applicable.
 5. Static Pressure:
 - a. Test and record system static pressures, including suction and discharge static pressure of each fan.
 6. Air Temperature:
 - a. Take wet-bulb and dry-bulb air temperatures on the entering and leaving side of each cooling coil. Dry-bulb temperature shall be taken on the entering and leaving side of each heating coil.
 7. Zone Ducts:
 - a. Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.
 8. Main Ducts:
 - a. Adjust main ducts to within design CFM requirements and traverse for total CFM quantities.
 9. Branch Ducts:
 - a. Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
 10. Tolerances:
 - a. Test and balance each diffuser, grille, and register to within 10 percent of design requirements.
 11. Identification:
 - a. Identify the location and area of each grille, diffuser, register, and terminal box. This information shall be recorded on air outlet data sheets.
 12. Description:
 - a. Record the size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.
 13. Terminal Boxes:
 - a. Set volume regulators on all terminal boxes to meet design maximum and minimum CFM requirements. All associated temperature controls shall be checked for proper operation and calibration. If the terminal boxes have separate settings for heating and cooling CFM, the CFM quantities for each shall be recorded on air outlet data sheets. All diffusers connected to the terminal box shall be read in the heating and cooling modes and their readings recorded on air outlet data sheets.
 14. Minimizing Drafts:
 - a. Adjust all diffusers, grilles, and registers to minimize drafts in all areas.

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1 3.6 CHILLED-WATER AND HOT-WATER PROCEDURES
2

- 3 A. The various water circulating systems shall be filled, purged of air, and put into operation by
4 the Mechanical Contractor before hydronic balancing.
5
6 B. The flow of water through all coils shall be adjusted by manipulating balancing valves until the
7 rated pressure drop through the coil or metering device is obtained.
8
9 C. The balancing agency shall perform the following testing and balancing functions in
10 accordance with the AABC National Standards:
11 1. Water Treatment:
12 a. Examine the water in the system and determine if the water has been treated and
13 cleaned. If it has not, request the Mechanical Contractor to clean the water and
14 request the Owner to treat the water.
15 2. Strainers:
16 a. Request that the Mechanical Contractor clean all strainers.
17 3. Valves:
18 a. Set all balancing valves and automatic temperature control bypass valves to the full-
19 open position for balancing. For three-way valves, the rated pressure drop shall first
20 be adjusted with the three-way valve set so that all water flows through the coil. The
21 bypass balancing valve shall then be adjusted on each coil until equal pressure drop
22 between supply and return connections is obtained, with the three-way valve set to
23 bypass the coil.
24 4. Pumps:
25 a. Adjust chilled-water, hot water, and condenser-water pump to meet design GPM
26 requirements. Check pumps for proper operation. Pumps shall be free of vibration
27 and cavitation. Measure and record operating current and voltage.
28 5. Central Plant:
29 a. Adjust water flow from the central plant, if applicable.
30 6. Tolerances:
31 a. Proceed to balance all chilled-water and hot-water coils within 10 percent of design
32 flow requirements.
33 7. Marking:
34 a. Mark all settings and record all data after completing the flow readings and coil
35 adjustments.
36

37 3.7 VERIFICATION OF TEMPERATURE CONTROL
38

- 39 A. The balancing agency shall be assisted by the Temperature Controls Contractor in verifying
40 the operation and calibration of all temperature control systems. The following tests shall be
41 conducted:
42 1. Verify that all control components are installed in accordance with project requirements
43 and are functional, including all electrical interlocks, damper sequences, air and water
44 reset, and fire and freeze stats.
45 2. Verify that all controlling instruments are calibrated and set for design operating
46 conditions.
47 3. Verify the accuracy of the final settings by taking temperature readings. The readings
48 shall be in a typical conditioned space for each separately controlled zone.
49
50 B. In the process of performing the TAB work, the balancing agency firm shall:
51 1. Verify that all dampers, valves and other controlled devices are operated by the intended
52 controller.
53 2. Verify that all dampers and valves are in the position indicated by the controller (open,
54 closed, or modulating).
55 3. Verify the integrity of valves and dampers in terms of tightness of close-off and of full-
56 open position. This includes dampers in VAV terminals.

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- 1 4. Check that all valves are properly installed in the piping system in relation to direction of
- 2 flow and location.
- 3 5. Verify the proper application of all normally open and normally closed valves.
- 4 6. Check the locations of all thermostats and humidistats for potential erratic operation from
- 5 outside influences such as sunlight, drafts, or cold/hot walls.
- 6 7. Check the locations of all sensors to determine whether their position will allow them to
- 7 sense only the intended temperatures or pressures of the media.
- 8 8. Check the sequence of operation for any control mode to ensure that it is in accordance
- 9 with the Contract Documents.
- 10
- 11 C. Verify that all controller set points meet the design intent. Record observations of systems
- 12 under DDC control. Record all default set points if different from operating set points.
- 13
- 14 D. Check all dampers for free and full operation, record any obstructions.
- 15
- 16 E. Verify the operation of all interlock systems.
- 17
- 18 F. Perform all system verifications to assure the safety of the system and its components.
- 19
- 20 G. Verify that the changeover from heating to cooling mode occurs as specified.
- 21
- 22 3.8 TEST AND BALANCE REPORT
- 23
- 24 A. The test and balance report shall be complete with logs, data, and records as required herein.
- 25 All logs, data, and records shall be typed on white bond paper and bound and submitted in a
- 26 single PDF file. The report shall be certified, accurate and complete by the balancing agency's
- 27 certified Test and Balance Engineer.
- 28
- 29 B. The report shall contain the following general data in a format selected by the balancing
- 30 agency:
- 31 1. Project number
- 32 2. Contract number
- 33 3. Project title
- 34 4. Project location
- 35 5. Project Architect
- 36 6. Project Mechanical Engineer
- 37 7. Test & Balance agency
- 38 8. Test & Balance Engineer
- 39 9. General Contractor
- 40 10. Mechanical Subcontractor
- 41 11. Dates tests were performed
- 42 12. Certification
- 43
- 44 C. The test and balance report shall be recorded on report forms conforming to the recommended
- 45 forms in the AABC National Standards. At a minimum, the report shall include:
- 46 1. Preface
- 47 a. A general discussion of the system, any abnormalities and problems encountered.
- 48 b. A deficiency log detailing system abnormalities that do not meet these specifications.
- 49 c. The list of instruments including type, model, manufacturer, serial number, and
- 50 calibration dates.
- 51 2. Air System Data
- 52 a. All test and balance data indicating design conditions, and actual conditions of
- 53 operation for each device and/or piece of HVAC equipment.
- 54 b. Outside Air Temperatures, dry bulb and wet bulb.
- 55 c. Entering Air Temperatures, dry bulb and wet bulb.

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- 1 d. Discharge Air Temperatures, dry bulb and wet bulb.
- 2 e. Suction and discharge static pressures across each fan.
- 3 3. Water System Data
- 4 a. All test and balance data indicating design conditions, and actual conditions of
- 5 operation for each device and/or piece of HVAC equipment.
- 6 b. Verification of valve positioning and static pressures across valves
- 7 c. Entering and Leaving water temperatures across all coils.
- 8 d. Static pressure drops across all coils.
- 9 e. Static pressure drops across all equipment (chillers, pumps, boilers, cooling towers,
- 10 etc.)
- 11 4. System Identification
- 12 a. In each report, the zones, supply, return, and exhaust openings, and traverse points
- 13 shall be numbered and/or lettered on mechanical drawings to correspond to the
- 14 numbers and letters used on the report data sheets.
- 15 5. Controls
- 16 a. Document verification of controls.
- 17 6. Occupancy Inspection
- 18 a. Make a total of three (3) inspections within ninety (90) days after occupancy of the
- 19 building, and make adjustments if required, to ensure that satisfactory conditions are
- 20 being maintained throughout. Inspections to be coordinated with Architect/Engineer
- 21 and Owner and shall be documented with a supplemental report containing data and
- 22 information as required.
- 23 7. Instructions to Operating Personnel
- 24 a. Test and Balance Firm shall instruct the operating personnel regarding the following:
- 25 (1) Systems Operation
- 26 (2) Unusual Operating Conditions.
- 27 (3) System Troubleshooting Procedures.
- 28

29 3.9 REPORT SUBMITTAL

- 30
- 31 A. The test and balance report are required and shall be submitted to the General Contractor for
- 32 distribution to the Owner, Architect and Mechanical Engineer. The test and balance report
- 33 shall be submitted in a single, fully bound PDF file.
- 34

35 3.10 FINAL ACCEPTANCE

- 36
- 37 A. At the time of final inspection, the balancing agency shall recheck, in the presence of the
- 38 Owner's representative, specific and random selections of data recorded in the certified test
- 39 and balance report.
- 40
- 41 B. Points and areas for recheck shall be selected by the Owner's representative.
- 42
- 43 C. Measurements and test procedures shall be the same as the original test and balance.
- 44
- 45 D. Selections for recheck, specific plus random, shall not normally exceed 15 percent of the total
- 46 number tabulated in the report, except where special air systems require a complete recheck
- 47 for safety reasons.
- 48
- 49 E. If random tests demonstrate a measured flow deviation of 10 percent or more from that
- 50 recorded in the certified test and balance report, the report shall automatically be rejected. In
- 51 the event the report is rejected, all systems shall be readjusted and tested, new data recorded,
- 52 a new certified test and balance report submitted, and a new inspection test made, all at no
- 53 additional cost to the Owner.
- 54

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1 3.11 OPPOSITE SEASON TEST
2

3 A. Opposite season test and balance work shall be required for systems that cannot be tested
4 and balanced due to climate or seasonal conditions. An example would be Chiller operation
5 in the winter season, or Boiler operation in the summer season. In such case, the balancing
6 agency shall perform an inspection of the buildings HVAC system during the opposite season
7 from that in which the initial adjustments were made. The balancing agency shall make any
8 necessary modifications to the initial adjustments to produce optimum system operation in
9 compliance with the contract documents. The TAB agency shall contact the Owner's
10 Commissioning Agent, to coordinate such work, no less than 14 calendar days prior to any
11 Opposite Season Testing.

12 B. Opposite Season Testing is not required if the Owner's Commissioning Agent can simulate off
13 season conditions via the building automated controls system.
14

15
16
END OF SECTION

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SECTION 23 07 19

HYDRONIC PIPING INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 23 00 00, apply to this Section.

1.2 SECTION INCLUDES

- A. Hydronic Piping Insulation
 - 1. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required, for the correct fabrication and installation of thermal insulation applied to the following piping systems:
 - a. Chilled water systems from 35°F (2°C) to 65°F (18°C) valves and appurtenances.
 - b. Space heating systems (hot water), ambient up to 250°F (121°C) valves and appurtenances.
 - c. EPDM Closed-cell flexible elastomeric foam pipe insulation (Armaflex or Aeroflex).
For ease of installation, EPDM closed cell structure insulation to be installed within 36" of coil connections, valve connections, and pump connections.

1.3 RELATED SECTIONS

- A. Section 22 07 20 - Piping Insulation
- B. Section 23 00 00 - Basic Mechanical Requirements
- C. Section 23 21 13 - Hydronic Piping, Valves, and Appurtenances

1.4 REFERENCES

- A. Refer to Section 23 00 00 for complete names of references identified in this section.
 - ASTM E 84 Fire and Smoke Ratings
 - ASTM C 177 Standard Test Method for Steady-State Heat Flux Measurements & Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
 - ASTM C 547 Specification for Mineral Fiber Pipe
 - ASTM C 585 Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)
 - ASTM C 795 Standard Specifications for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
 - ASTM C 1136 Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
 - NFPA 255 Surface Burning Characteristics of Building Materials
 - UL 723 Composite Surface Burning Characteristics
 - NACIIS North American Commercial & Industrial Insulation Standards (NACIIS)

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- 1 1.5 SUBMITTALS
2
3 A. Product Data:
4 1. Provide submittal data on all equipment specified in this section in accordance with
5 Section 23 00 90, General Conditions, and Division 1.
6
7 B. Submit product data indicating typical catalog of information.
8
9 C. Submit product data sheets indicating dimensions, general assembly, and ratings.
10
11 D. Submit manufacturer's installation instructions and method of application.
12
13 E. Submit piping insulation summary sheet, which includes at least the following: type of pipe
14 and pipe thickness, type of insulation and insulation thickness, and jacketing material.
15
- 16 1.6 DEFINITIONS
17
18 A. Concealed: Hidden from sight as in trenches, chases, furred spaces, walls, pipe shafts, or
19 hung ceilings.
20
21 B. Exposed: Not "concealed" as defined above. Normally open and visible to building occupants
22 (such as gymnasiums, mechanical rooms etc.).
23
24 C. Crawlspace: Under the building slab in an unconditioned space that is exposed to ambient
25 conditions.
26
- 27 1.7 QUALITY ASSURANCE
28
29 A. Fire Hazard Rating:
30 1. All insulation used on the project must have a flame spread rating not exceeding 25 and
31 a smoke developed rating not exceeding 50 as determined by test procedures ASTM
32 E84, NFPA 255 and UL 723. Bear UL label. All insulation must meet ASTM C553.
33 2. These ratings must be tested on the composite of insulation, jacket or facing, and
34 adhesive.
35 3. Components such as adhesives, mastics and cements must meet the same individual
36 ratings as minimum requirements.
37
38 B. Quality Controls:
39 1. All insulation shall be the product of reputable manufacturers.
40 2. All insulation shall be applied by licensed mechanics skilled in the use of various
41 insulations, adhesives, and jacketing materials. Submit qualifications of insulator with
42 insulation submittals.
43 3. The materials shall be applied in accordance with the special materials as required by
44 these specifications and by the manufacturer standards.
45 4. Poor workmanship or appearance will be cause for rejection.
46 5. Insulation materials that have become wet or contaminated shall not be installed.
47
48 C. Insulations shall not contain formaldehyde, asbestos, lead, mercury, mercury compounds, or
49 poly-brominated diphenyl ether fire retardants.
50
51 D. Fiberglass insulations shall have recycled glass content; certified and UL Validated.
52
53 E. Fiberglass insulations shall have a bio-based, formaldehyde-free binder and be UL
54 GREENGUARD Gold certified.
55

56 PART 2 PRODUCTS

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1 2.1 GENERAL
2

- 3 A. Molded pipe insulation shall be manufactured to meet ASTM C 585 for sizes required in the
4 particular system. It shall be of a type suitable for installation on piping systems as defined in
5 section above.
6
7 B. Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C 547.
8
9 C. Insulation materials furnished and installed hereunder shall meet the fire hazard requirements
10 of applicable building codes when tested in composite form per one of the following nominally
11 equivalent test methods:
12 1. American Society for Testing of Materials - ASTM E 84
13 2. Underwriters' Laboratories, Inc. - UL 723
14 3. National Fire Protection - NFPA 255
15
16 D. Molded CFC-free phenolic pipe insulation shall be manufactured in accordance with ASTM C
17 1126-98, Grade 1 Type II and III "Standard Specification for Faced or Un-faced for Rigid
18 Cellular Phenolic Thermal Insulation" and shall be suitable for installation on piping systems
19 defined.
20

21 2.2 ABOVE GROUND PIPE INSULATION
22

- 23 A. Manufacturers:
24 1. Owens/Corning
25 2. Knauf Insulation
26 3. Manson Insulation
27 4. Johns Manville
28 5. Polyguard - Phenolic
29 6. Resolco - Phenolic
30
31 B. Types:
32 1. Fiberglass insulation; pipe, tank and rolls.
33 2. Phenolic Foam with field applied, zero permeability absolute vapor barrier laminate
34 jacket having cold weather acrylic adhesive self-sealing lap.
35
36 C. Fiberglass Construction:
37 1. Fiberglass preformed pipe covering insulation complying with ASTM C 547, Type I (850
38 degrees F) or Type IV (1000 degrees F); ASTM C 585, ASTM C 411, ASTM C 795, and
39 UL/ULC Classified. Fiberglass shall be bonded with a bio-based, thermosetting resin
40 binder.
41 2. Provide insulation with factory applied, white ASJ SSL, vapor retarder jacket complying
42 with ASTM C 1136.
43 3. Thermal conductivity ASTM C 335 (k-value) at 75 degrees F mean temperature shall be
44 0.23 Btu x in. /h x sq. ft. x degrees F, or less. Service temperature range of 0 degrees F
45 minimum to 1000 degrees F maximum.
46 4. Flame spread/Smoke-developed Rating (ASTM E84) of 25/50. Must be UL Environment
47 GREENGUARD Gold certified and UL Validated Formaldehyde-free.
48
49 D. Minimum Pipe Insulation Thickness:
50 1. Chilled water piping systems (Fiberglass Insulation):
51 a. Indoor Applications (above ceilings, mechanical rooms):
52 (1) All pipe sizes - 1 1/2" insulation thickness.
53 b. Outdoor Applications:
54 (1) All pipe sizes - 2" insulation thickness
55 c. Crawlspace Applications:
56 (1) All pipe sizes - 2" insulation thickness

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2. Hot water piping systems (Fiberglass Insulation):
 - a. Indoor Applications (above ceilings, mechanical rooms):
 - (1) 1 1/2" Diameter piping and less - 1 1/2" insulation thickness
 - (2) All piping greater than 1 1/2" Diameter - 2" insulation thickness.
 - b. Outdoor Applications:
 - (1) All pipe sizes - 2" insulation thickness
 - c. Crawlspace Applications:
 - (1) All pipe sizes - 2" insulation thickness
3. Condenser water piping systems:
 - a. Indoor Applications (above ceilings, mechanical rooms):
 - (1) Insulation is not required.
 - b. Outdoor Applications:
 - (1) All pipe sizes - 2" insulation thickness with electric heat trace tape.
4. Chilled water piping systems (Phenolic Foam Insulation):
 - a. Indoor Applications (above ceilings, mechanical rooms):
 - (1) All pipe sizes - 1 1/2" insulation thickness.
 - b. Outdoor Applications:
 - (1) All pipe sizes - 2" insulation thickness
 - c. Crawlspace Applications:
 - (1) All pipe sizes - 2" insulation thickness

22 2.3 JACKETING MATERIALS

- 23
- 24 A. Manufacturers:
 - 25 1. 3M / Venture Clad
 - 26 2. Polyguard
 - 27 3. RPR Products
 - 28 4. Foster Childers
 - 29 5. Ideal Products
- 30
- 31 B. Indoor Applications:
 - 32 1. Flexible, zero permeability, absolute vapor barrier of 5-ply cold weather acrylic adhesive
 - 33 construction by Venture Clad 1579GCW, or equal with 3-inch butt strips. Meets or
 - 34 exceeds ASTM C1775.
- 35
- 36 C. Outdoor Applications:
 - 37 1. Flexible, zero permeability, absolute vapor barrier of 5-ply cold weather acrylic adhesive
 - 38 construction by Venture Clad 1577CW, or equal with 3-inch butt strips. Meets or exceeds
 - 39 ASTM C1775.
 - 40 2. Metal jacketing shall be 0.016-inch minimum aluminum or stainless steel with moisture
 - 41 barrier, secured in accordance with jacket manufacturer's recommendations. Use bands
 - 42 and seals of the same material. Use preformed fitting covers matching jacket used on
 - 43 straight pipe, with all joints weather sealed with metal sealant. RPR Products or equal.
 - 44
- 45 D. Mechanical Rooms and Exposed Indoor Applications:
 - 46 1. Flexible, zero permeability, absolute vapor barrier of 5-ply cold weather acrylic adhesive
 - 47 construction by Venture Clad 1579GCW or equal with 3-inch butt strips. Meets or
 - 48 exceeds ASTM C 1775.
 - 49 2. PVC jacketing secured in accordance with jacket manufacturer's recommendations. Use
 - 50 preformed fitting covers matching jacket used on straight pipe with all joints sealed.
 - 51
- 52 E. Crawlspace Applications:
 - 53 1. Flexible, zero permeability, absolute vapor barrier of 5-ply cold weather acrylic adhesive
 - 54 construction by Venture Clad 577CW, or equal with 3-inch butt strips. Meets or exceeds
 - 55 ASTM C 1775.

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1 2. PVC jacketing secured in accordance with jacket manufacturer's recommendations. Use
2 bands and seals of the same material. Use preformed fitting covers matching jacket used
3 on straight pipe with all joints sealed.
4

5 2.4 FLANGE, VALVE AND FITTING INSULATION
6

7 A. Manufacturers:

- 8 1. Zeston PVC
9 2. Proto PVC

10
11 B. Insulate fittings and valves with Hi-Lo temp fiberglass insulation inserts covered with molded
12 fitting PVC jacket covers. PVC - UV resistant and secured and sealed with tape. Equal to
13 Zeston 2000 by Johns Manville.
14

15 C. On all chilled water lines the insulation system shall be completely vapor sealed before
16 weather-resistant jacket is applied. Coat all flanges, valves and fittings with Foster 30-35 or
17 Childers CP-30LO vapor barrier coating and reinforcing mesh. Lines shall have properly
18 constructed vapor dams or vapor stops installed per NACIIS manual.
19

20 D. Valves:

- 21 1. All valves are to have insulated extension handles.
22

23 E. Insulate fittings and valves with molded or mitered **phenolic foam** fittings and covered with
24 molded PVC jacket covers.
25

26 2.5 SEALANT AND COATING
27

28 A. Joint Sealant:

- 29 1. Shall be a high solids containing non-setting butyl rubber product.
30

31 B. Manufacturers:

- 32 1. Foster Flextra Sealant 95-50
33 2. Childers Chil Byl CP-76.
34 3. Vimasco equivalent
35 4. Mon-Eco equivalent
36

37 C. Usage:

- 38 1. Valve covers, anchors and hangers
39 a. Longitudinal laps of the vapor barrier jacket
40 b. Butt joint covers.
41

42 2.6 VAPOR BARRIER COATING
43

44 A. Manufacturers:

- 45 1. Foster 30-35
46 2. Childers CP-30LO
47 3. Vimasco equivalent
48 4. Mon-Eco equivalent
49

50 B. Usage:

- 51 1. On all elbows/fittings on below ambient piping. Used in conjunction with reinforcing mesh.
52 2. Vapor stops.
53 3. Completing factory installed vapor retarders like ASJ and FSK.
54

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- 1 2.7 METAL JACKET SEALANT
2
3 A. Manufacturers:
4 1. Foster 95-44
5 2. Childers CP-76
6 3. Vimasco equivalent
7 4. Mon-Eco equivalent
8
9 B. Usage
10 1. Seal metal jacketing overlaps and at flashing penetrations.
11
12 2.8 WEATHER BARRIER MASTIC
13
14 A. Manufacturers:
15 1. Foster 46-50
16 2. Childers CP-10
17 3. Vimasco equivalent
18 4. Mon-Eco equivalent
19
20 B. Usage
21 1. Used on piping to protect insulation from weather. Used in conjunction with reinforcing
22 mesh.
23
24 2.9 PIPE SUPPORTS
25
26 A. Pipe supports to be polyisocyanurate (PIR) insulation or equal, full circumference high density
27 insulation that can withstand bearing load from the pipe.
28
29 2.10 INSULATION SHIELD
30
31 A. Field-fabricated:
32 1. Construction:
33 a. Insulation to support the bearing area at hangers and supports with a shield of
34 galvanized metal extending not less than 4 inches on either side of the support
35 bearing area, covering at least half of the pipe circumference. When pipe is guided
36 at top and bottom, metal shields should cover the whole pipe circumference. Adhere
37 metal shield to insulation so that metal will not slide with respect to insulation.
38
39 B. Schedule:
40 1. 3-inch and smaller pipe diameter: 12 inch insulated section, 18 gauge metal shield
41 2. Greater than 3-inch pipe diameter: 12 inch insulated section, 16 gauge metal shield
42
43 C. Factory-made:
44 1. Manufacturer:
45 a. Pipe Shields, Inc.
46 b. Buckaroos
47 c. Equivalent
48
49 2. Type:
50 a. Proper shield for service and pipe span.
51
52 3. Construction:
53 a. Extend insulation at least 1 inch beyond metal.
54 b. Insulation shall not compress at hanger.
55

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1 2.11 EPDM ELASTOMERIC CLOSED-CELL STRUCTURE INSULATION
2

3 A. Manufacturers:

- 4 1. Armacell
5 2. Aeroflex
6

7 B. Usage:

- 8 1. May be installed within 3 ft of chilled water coils, hot water coils, and on pump bodies.
9 Size equal to or greater than fiberglass insulation thickness.
10

11 C. Construction:

- 12 1. EPDM Closed cell elastomeric insulation
13 2. Resistant to ultraviolet and biological degradation as demonstrated by ASTM G7 and
14 ASTM G90
15 3. Temperature Range: -297°F to 220°F
16 4. Water Vapor Permeability (Dry Cup): Less than 0.03 per inch when measured by ASTM
17 E96.
18 5. Thermal Conductivity: 0.245 - 0.28 BTU-IN/HR-F²-°F or less at 75°F mean temperature
19 6. Maximum water vapor transmission of 0.08 perm-inches in accordance with ASTM E 96
20

21 D. Adhesives: Armaflex 520 BLV or equivalent
22
23

24 PART 3 EXECUTION
25

26 3.1 SITE INSPECTION
27

28 A. Before starting work under this section, carefully inspect the site and installed work of other
29 trades and verify that such work is complete to the point where installation of materials and
30 accessories under this section can begin.
31

32 B. Verify that all materials and accessories can be installed in accordance with project drawings
33 and specifications and material manufacturers' recommendations.
34

35 C. Verify, by inspecting product labeling, submittal data, and/or certifications which may
36 accompany the shipments, that all materials and accessories to be installed on the project
37 comply with applicable specifications and standards and meet specified thermal and physical
38 properties.
39

40 3.2 PREPARATION
41

42 A. Ensure that all pipe and fitting surfaces over which insulation is to be installed are clean, dry
43 and free from dirt, scale, moisture, oil and grease prior to installing insulation. Remove
44 materials that will adversely affect insulation application.
45

46 B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied
47 vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not
48 be acceptable for installation.
49

50 C. Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to
51 insulated surfaces as follow:

- 52 1. Carbon Steel: Coat carbon steel piping operating at a service temperature between 32°F
53 and 300°F with an epoxy coating. Consult coating manufacturer for appropriate coating
54 materials and application methods for operating temperature range.
55

56 D. Complete pressure testing of piping and fittings prior to installing insulation.

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1 3.3 INSTALLATION
2

- 3 A. To ensure that it will achieve its highest possible performance and serve its intended purpose,
4 install all insulation materials and accessories in accordance with manufacturer's published
5 instructions (latest edition) and industry practices detailed by the North American Commercial
6 and Industrial Insulation Standards manual (latest edition).
7
- 8 B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces;
9 free of voids throughout the length of equipment, piping, fittings, valves, specialties, etc.
10
- 11 C. Install insulation materials, forms, vapor barriers, jackets, etc. to the thicknesses required for
12 each item and equipment.
13
- 14 D. All penetrations of the jacket and exposed ends of insulation shall be sealed with vapor barrier
15 coating. The jacket shall be protected with the specified vapor retarding outer jacket. Vapor
16 dam/stop at butt joints shall be applied at every fourth pipe section joint and at each fitting to
17 provide isolation of water incursion. Mark each joint so that Engineer can verify.
18
- 19 E. Install insulation on piping subsequent to installation of heat tracing, painting, and acceptance
20 tests.
21
- 22 F. Do not install insulation on any pipe if chiller is operating.
23
- 24 G. Keep insulation materials dry during application and finishing.
25
- 26 H. Install insulation with the least number of joins practical.
27

28 3.4 INDOOR PIPE
29

- 30 A. Insulation to be continuous through wall and ceiling penetrations.
31
- 32 B. Insulation to be continuous over all valves and appurtenances.
33
- 34 C. Insulation shall be applied to piping with all joints tightly fitted to eliminate voids. For systems
35 operating at or below 35 degrees all joints must be sealed full depth with sealant. Do not install
36 insulation on cold or wet pipes.
37
- 38 D. Sealant shall not be used to fill voids or cracks.
39
- 40 E. Insulation sections shall be secured with aluminum bands. Two strips of reinforced tape may
41 be used in place of bands if exterior bands are used with jacketing. The tape shall overlap
42 itself by 50%.
43
- 44 F. Apply zero-perm vapor barrier jacketing in accordance with manufacturer's instructions,
45 insuring a minimum 3-inch lap at all longitudinal joints. All circumferential joints should butt as
46 close as possible. A 3-inch wide butt strip shall be applied over the circumferential joints. All
47 laps and butt strips shall be adhesive-faced (self-seal).
48

49 3.5 VALVES, FLANGES, AND FITTINGS
50

- 51 A. Insulate all valves, flanges, and fittings with covers secured with Velcro with equivalent
52 thickness and composition installation on straight pipes.
53
- 54 B. Finish with 1/4 inch layer of Foster 30-35 or Childers CP-30LO reinforced with reinforced
55 mesh.
56

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1 C. Factory made covers equal to Proto Corporation or Johns Manville Zeston are acceptable
2

3 3.6 CONTROL VALVE COVERS
4

5 A. Fabricate special covers, complete with troweled-on vapor seal, shaped to accommodate the
6 valve stem. Insulation thickness shall be same thickness as adjoining pipe.
7

8 B. Seal covers to valve insulation properly with adhesive so that the seal may be broken with a
9 knife blade without damage to either part. Arrange so that cover can be removed and replaced
10 as necessary for operation of the valve.
11

12 C. Finish valve cover with glass cloth and two coats of vapor barrier coating.
13

14 D. Factory made covers are acceptable. Provide submittal.
15

16 3.7 REPAIRS AND REPLACEMENT
17

18 A. Replace any insulation that has ever been wet.
19

20 B. Repair any damage caused by condensation due to improper insulating.
21

22 3.8 INDOOR EXPOSED PIPING
23

24 A. Insulate piping exposed to view with a PVC jacket to present a smooth finished look.
25

26 B. Install PVC jacketing with 1-inch overlap at longitudinal seams and end joints.
27

28 C. PVC jacketing color to be coordinated with architect/ engineer. PVC jacketing to be colored at
29 the factory. Do not field paint PVC jacketing.
30

31 3.9 CRAWLSPACE PIPING
32

33 A. Insulate piping with a PVC jacket to present a smooth finished look.
34

35 B. Install PVC jacketing with 1-inch overlap at longitudinal seams and end joints.
36

37 C. PVC jacketing color to be coordinated with architect/ engineer. PVC jacketing to be colored at
38 the factory. Do not field paint PVC jacketing.
39

40 3.10 OUTDOOR PIPING
41

42 A. Aluminum jacketing shall be applied with all laps positioned to shed water. All laps shall be a
43 minimum of 2-inch.
44

45 B. Metal jacketing shall be 0.016" minimum aluminum or stainless steel.
46

47 C. Jacketing shall have moisture barrier, secured in accordance with jacket manufacturer's
48 recommendations. Moisture barrier layer shall be polykraft or polysurlyn.
49

50 D. Aluminum jacketing shall be secured using bands and seals as specified. Band spacing shall
51 be two bands equally spaced per section of insulation. This will usually mean 9-inch or 12-
52 inch on center. Seal all jacketing overlaps with metal jacketing sealant with 1/8" bead under
53 each lap.
54

55 E. Do not field paint aluminum jacketing.
56

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1 3.11 SHIELDS AND HANGERS
2

- 3 A. Where piping hangers or anchors must be in direct contact with pipe, seal off the pipe
4 insulation on both sides of the hanger by carrying the vapor seal down to the bare pipe.
5
6 B. At the location of hangers or supports for pipes run above ground and finished with a vapor
7 seal insulation, provide rigid sections of insulation the same thickness as adjacent insulating
8 material to adequately support the pipe without compression of the insulating material and
9 cover with a vapor seal that is bonded to the adjacent insulation as described for fittings in the
10 lines. Wood inserts shall not be allowed. Hangers and supports for piping insulation to receive
11 a vapor barrier shall be installed exterior to the insulation.
12
13 C. Material Changes:
14 1. Wherever there is a change in materials on lines that are vapor sealed, apply a suitable
15 adhesive that is compatible with both materials, tapes, etc., as required to maintain the
16 vapor barrier.
17
18 D. Apply insulation around the hanger ring or anchor and pipe and carry vapor barrier upward
19 and outward along the hanger rod or anchor members to a point not less than 12 inches from
20 the adjacent pipe.
21
22 E. Take care to avoid puncturing the vapor seal.
23
24 F. Finish insulation as specified for flanges, and seal over adjacent vapor barrier jacket.
25

26 3.12 FIELD QUALITY ASSURANCE
27

- 28 A. Upon completion of all insulation work covered by this specification, visually inspect the work
29 and verify that it has been correctly installed. This may be done while work is in progress, to
30 assure compliance with requirements herein to cover and protect insulation materials during
31 installation.
32

33 3.13 PROTECTION
34

- 35 A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with
36 vapor barrier damage and moisture-saturated insulation.
37
38 B. The insulation contractor shall advise the general and/or the mechanical contractor as to
39 requirements for protection of the insulation work during the remainder of the construction
40 period, to avoid damage and deterioration of the finished insulation work.
41

42 END OF SECTION

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SECTION 23 08 00

COMMISSIONING OF HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.
- B. Division 01 section 'Building Systems Commissioning'.

1.2 SUMMARY

- A. This section includes commissioning process requirements for Mechanical systems, assemblies, and equipment.
- B. Related Sections:
 - 1. Division 01 Section "Building Systems Commissioning" for general commissioning process requirements.

1.3 DESCRIPTION

- A. Refer to Division 01 Section "Building Systems Commissioning" for the description of commissioning.

1.4 DEFINITIONS

- A. Refer to Division 01 Section "Building Systems Commissioning" for definitions.

1.5 SUBMITTALS

- A. Refer to Division 01 Section "Building Systems Commissioning" for CxA's role.
- B. Refer to Division 01 Section "Submittals" for specific requirements. In addition, provide the following:
 - 1. Certificates of readiness
 - 2. Certificates of completion of installation, prestart, and startup activities.
 - 3. O&M manuals
 - 4. Test reports

1.6 QUALITY ASSURANCE

- A. Test Equipment Calibration Requirements: Contractors will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.7 COORDINATION

- A. Refer to Division 01 Section "Building Systems Commissioning" for requirements pertaining to coordination during the commissioning process.

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PART 2 PRODUCTS

2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the mechanical systems and controls systems in Division 23. A sufficient quantity of two-way radios shall be provided by each contractor.
- B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the base bid price to the Owner and left on site, except for stand-alone data logging equipment that may be used by the CxA.
- C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.
- D. Data logging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the Owner.
- E. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

PART 3 EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

- A. With assistance from the installing contractors, the CxA will prepare Functional Testing Forms for all commissioned components, equipment, and systems.
- B. Red-lined Drawings:
 - 1. The contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
 - 2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
 - 3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
 - 4. The contracted party, as defined in the Contract Documents will create the as-built drawings.
- C. Operation and Maintenance Data:
 - 1. Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems.
 - 2. The CxA will review the O&M literature once for conformance to project requirements.
 - 3. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.

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1 D. Systems manual requirements:

- 2 1. The Systems Manual is intended to be a usable information resource containing all of the
3 information related to the systems, assemblies, and Commissioning Process in one place
4 with indexes and cross references.
5 2. The GC shall include final approved versions of the following information for the Systems
6 Manual:
7 a. As-Built System Schematics
8 b. Verified Record Drawings
9 c. Test Results (not otherwise included in Cx Record)
10 d. Periodic Maintenance Information for computer maintenance management system
11 e. Recommendations for recalibration frequency of sensors and actuators
12 f. A list of contractors, subcontractors, suppliers, architects, and engineers involved in
13 the project along with their contact information
14 g. Training Records, Information on training provided, attendees list, and any on-going
15 training
16 3. This information shall be organized and arranged by building system, such as fire alarm,
17 chilled water, heating hot water, etc.
18 4. Information should be provided in an electronic version to the extent possible. Legible,
19 scanned images are acceptable for non-electronic documentation to facilitate this
20 deliverable.
21

22 3.2 CONTRACTOR'S RESPONSIBILITIES

- 23
24 A. Perform commissioning tests at the direction of the CxA.
25
26 B. Attend construction phase controls coordination meetings.
27
28 C. Participate in Mechanical systems, assemblies, equipment, and component maintenance
29 orientation and inspection as directed by the CxA.
30
31 D. Provide information requested by the CxA for final commissioning documentation.
32
33 E. Include requirements for submittal data, operation and maintenance data, and training in each
34 purchase order or sub-contract written.
35
36 F. Prepare preliminary schedule for Mechanical system orientations and inspections, operation
37 and maintenance manual submissions, training sessions, equipment start-up and task
38 completion for owner.
39
40 G. Update schedule as required throughout the construction period.
41
42 H. Perform and clearly document all completed startup and system operational checkout
43 procedures, providing a copy to the CxA.
44
45 I. Assist the CxA in all verification and functional performance tests.
46
47 J. Provide measuring instruments and logging devices to record test data, and provide data
48 acquisition equipment to record data for the complete range of testing for the required test
49 period.
50
51 K. Gather operation and maintenance literature on all equipment, and assemble in binders as
52 required by the specifications. Submit to CxA 45 days after submittal acceptance.
53
54 L. Participate in, and schedule vendors and contractors to participate in the training sessions.
55

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1 M. Provide written notification to the CM/GC and CxA that the following work has been completed
2 in accordance with the contract documents, and that the equipment, systems, and sub-system
3 are operating as required.

Cx Systems	Require Fx Testing	Items Tested
HVAC		
__ Chilled Water Plants	Yes	Controls, Sequence of Operations, Alarms
__ Hot Water Plants	Yes	Controls, Sequence of Operations, Alarms
__ Air Handling Units	Yes	Controls, Sequence of Operations, Alarms, Economizer
__ Packaged Units (RTU and HP)	Yes	Controls, Sequence of Operations, Alarms, Economizer
__ Terminal Units/VAV's	Yes	Controls, Sequence of Operations, Alarms, Economizer
__ Exhaust and Relief fans	Yes	Controls, Sequence of Operations, Alarms
__ DDC Control System (<i>Component installation and System Operation</i>)	Yes	System calibration and function

4
5 N. The equipment supplier shall document the performance of his equipment.
6
7 O. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional
8 Performance Testing.
9
10 P. Provide training of the Owner’s operating staff using expert qualified personnel, as specified.
11
12 Q. Equipment Suppliers
13 1. Provide all requested submittal data, including detailed start-up procedures and specific
14 responsibilities of the Owner, to keep warranties in force.
15 2. Assist in equipment testing per agreements with contractors.
16 3. Provide information requested by CxA regarding equipment sequence of operation and
17 testing procedures.
18
19 R. Refer to Division 01 Section “Building Systems Commissioning” for additional Contractor
20 responsibilities.

21 3.3 OWNER’S RESPONSIBILITIES

22 A. Refer to Division 01 Section “Building Systems Commissioning” for Owner’s Responsibilities.
23

24 3.4 DESIGN PROFESSIONAL’S RESPONSIBILITIES

25 A. Refer to Division 01 Section “Building Systems Commissioning” for Design Professional’s
26 Responsibilities.
27

28 3.5 CXA’S RESPONSIBILITIES

29 A. Refer to Division 01 Section “Building Systems Commissioning” for CxA’s Responsibilities.
30
31
32
33
34

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- 1 3.6 TESTING PREPARATION
2
3 A. Certify in writing to the CxA that Mechanical systems, subsystems, and equipment have been
4 installed, calibrated, and started and are operating according to the Contract Documents.
5
6 B. Certify in writing to the CxA that Mechanical instrumentation and control systems have been
7 completed and calibrated, that they are operating according to the Contract Documents, and
8 that pretest set points have been recorded.
9
10 C. Certify in writing that testing procedures have been completed and that testing reports have
11 been submitted, discrepancies corrected, and corrective work approved.
12
13 D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal
14 shutdown, normal auto position, normal manual position, unoccupied cycle, emergency
15 power, and alarm conditions).
16
17 E. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during
18 each mode of operation.
19
20 F. Testing Instrumentation: Install measuring instruments and logging devices to record test data
21 as directed by the CxA.
22
- 23 3.7 GENERAL TESTING REQUIREMENTS
24
25 A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction
26 of the CxA.
27
28 B. Scope of Mechanical testing shall include sequence of operations for HVAC equipment, HVAC
29 building automation control system, economizers; etc.
30
31 C. Test all operating modes, interlocks, control responses, and responses to abnormal or
32 emergency conditions, and verify proper response of building automation system controllers
33 and sensors.
34
35 D. Tests will be performed using design conditions whenever possible.
36
37 E. Simulated conditions may need to be imposed using an artificial load when it is not practical
38 to test under design conditions. Before simulating conditions, calibrate testing instruments.
39 Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and
40 document simulated conditions and methods of simulation. After tests, return settings to
41 normal operating conditions.
42
43 F. The CxA may direct that set points be altered when simulating conditions is not practical.
44
45 G. The CxA may direct that sensor values be altered with a signal generator when design or
46 simulating conditions and altering set points are not practical.
47
48 H. If tests cannot be completed because of a deficiency outside the scope of the Mechanical
49 system, document the deficiency and report it to the Owner. After deficiencies are resolved,
50 reschedule tests.
51
52 I. If the testing plan indicates specific seasonal testing, complete appropriate initial performance
53 tests and documentation and schedule seasonal tests.
54

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- 1 3.8 MECHANICAL SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES
- 2
- 3 A. Functional Performance Tests: Sample functional performance testing procedures are
- 4 included in Part 3.13. These procedures are representative of those that will be implemented
- 5 in the Cx process. The CxA may modify these procedures during the Construction Phase once
- 6 all systems are known and all required documentation has been provided.
- 7
- 8 B. Mechanical Instrumentation and Control System Testing: Assist the CxA with preparation of
- 9 testing plans.
- 10
- 11 3.9 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO
- 12 MANUFACTURER DEFECT
- 13
- 14 A. Refer to Division 01 Section “Building Systems Commissioning” for requirements pertaining to
- 15 deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.
- 16
- 17 3.10 APPROVAL
- 18
- 19 A. Refer to Division 01 Section “Building Systems Commissioning” for approval procedures.
- 20
- 21 3.11 DEFERRED TESTING
- 22
- 23 A. Refer to Division 01 Section “Building Systems Commissioning” for requirements pertaining to
- 24 deferred testing.
- 25
- 26 3.12 OPERATION AND MAINTENANCE MANUALS
- 27
- 28 A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements
- 29 as stated in Division 01.
- 30
- 31 B. Refer to Division 01 Section “Building Systems Commissioning” for the AE and CxA roles in
- 32 the Operation and Maintenance Manual contribution, review and approval process.
- 33
- 34 3.13 SAMPLE FUNCTIONAL PERFORMANCE TESTING PROCEDURES
- 35
- 36 A. These testing procedures are representative of those that will be implemented in the Cx
- 37 process. The CxA may modify these procedures during the Construction Phase once all
- 38 systems are known and all required documentation has been provided.
- 39

Example Systems

Electronic File Name

AHU

AHU-FT

43

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Functional Test Record- _____		
Project Owner: _____		
Project Type: _____		
Project Address:		
List Building Systems to Test:		
CH-1 & CH-2	Cooling Only VAV Terminal	Generator Run Status
BL-1 & BL-2	Electrical Room Exhaust Fans	Lighting
AHU-A1, A2, B1, B2, C1, C2, D1, D2	Boiler Room Supply Fan	Fire Alarm Monitoring
AHU-B3, E1, E2	Packaged Computer Room Units (MDF/IDF)	Utility Monitoring
AHU-E3	Freezer/Cooler	Relief Dampers
OAHU-A1, B1, E1	Kitchen Exhaust/Supply Fans	Power Monitoring
FCU-1	Dishwasher Exhaust	Outside Air Conditions
Constant Volume Terminal Unit with Hot Water Reheat	Building Emergency Shutdown	
Constant Volume Terminal Unit with Electric Reheat	General Exhaust Fans	
Beginning O. A. Temp: _____ (F)	Ending O.A. Temp: _____ (F)	% RH: (HI) _____ (LO) _____

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<p>List Weather conditions at the project site: Mostly dry conditions with a short shower.</p>			
<p>List Controls and HVAC Testing Spec Sections:</p>	<p>_____ , _____ , _____ , _____ , _____</p>		
<p>Building Environmental Conditions:</p>			
<p> <input type="checkbox"/> Clean <input type="checkbox"/> Dirty <input type="checkbox"/> Dry <input type="checkbox"/> Wet <input type="checkbox"/> Other In Construction </p>			
<p>Verify the following conditions prior to testing</p>	<p>Yes</p>	<p>No</p>	<p>If <u>No</u> is checked, list reason</p>
<p><input type="checkbox"/> AHU/O.A/CV Boxes have clean filters installed</p>	<input type="checkbox"/>	<input type="checkbox"/>	
<p><input type="checkbox"/> Final Filters are as specified</p>	<input type="checkbox"/>	<input type="checkbox"/>	
<p><input type="checkbox"/> Ductwork protective covers have been removed</p>	<input type="checkbox"/>	<input type="checkbox"/>	
<p><input type="checkbox"/> TAB is Complete for systems being tested</p>	<input type="checkbox"/>	<input type="checkbox"/>	
<p><input type="checkbox"/> Controls are complete and system is controlled from DDC control panel/laptop</p>	<input type="checkbox"/>	<input type="checkbox"/>	

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Verify the following documentation requirements have been met prior to testing	Yes	No
Checklists have been sampled for review by the CxA to determine the operational readiness for systems being tested	<input type="checkbox"/>	<input type="checkbox"/>
TAB <u>Draft Field Report</u> has been reviewed and all know TAB deficiencies are corrected or noted by the Cx Agent	<input type="checkbox"/>	<input type="checkbox"/>
Controls Contractor completed Pre-Commissioning Checklist has been reviewed by the CxA	<input type="checkbox"/>	<input type="checkbox"/>
General Contractor has been notified of the CxA scheduled testing dates and times. This is related to coordination with Life Safety Systems testing by the AHJ or Fire Marshal.	<input type="checkbox"/>	<input type="checkbox"/>
All issues identified and recorded on the Cx Issues Log or reported to the GC have been resolved	<input type="checkbox"/>	<input type="checkbox"/>
COMMISSIONING CHECKLISTS:		
<input type="checkbox"/> REVIEWED by CxA <input type="checkbox"/> COMPLETE <input type="checkbox"/> INCOMPLETE		
TAB FIELD REPORT:		
<input type="checkbox"/> SUBMITTED <input type="checkbox"/> NOT SUBMITTED		
<input type="checkbox"/> REVIEWED <input type="checkbox"/> NOT REVIEWED		
CEILING SYSTEMS/GRID INSTALLED IN ALL AREAS UNDER TEST		
<input type="checkbox"/> YES <input type="checkbox"/> NO		
LIGHTING SYSTEMS:		
<input type="checkbox"/> INDOOR <input type="checkbox"/> EXTERIOR <input type="checkbox"/> SITE <input type="checkbox"/> NOT TESTED		
<input type="checkbox"/> INSTALLED <input type="checkbox"/> FULLY OPERATIONAL <input type="checkbox"/> PRE-TESTED BY CONTROLS SUB		
<input type="checkbox"/> NOT INSTALLED <input type="checkbox"/> NOT FULLY OPERATIONAL <input type="checkbox"/> NOT PRE-TESTED		

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COMMENTS:

CxA Note: Items found noncompliant, incomplete, in variance to the contract documents or fail to perform as intended per the contract documents and engineer approved control sequences, will be documented in writing, and the GC, Owner’s PM and Engineer of record will be notified of the discrepancy. The GC will be responsible for ensuring his sub-contractors resolve issues reported, in a timely manner and to notify the CxA that the system is made ready for Functional Retest.

Building Occupied/Unoccupied Schedule:

Day of Week	Area	System Enabled	Occ	Syst. Disabled	Un-Occ
Monday - Friday	Admin	6:00 AM	7:00 AM	3:30 PM	4:00 PM
	Classrooms				
	Gym				
	Cafeteria				
	General Spaces				
Weekend	Scheduled as requested per facility request				
Holidays	Scheduled as requested per facility request				

Note:

Optimum Start Program:	Yes	No	Comments
Yes			
No			
Required	<input type="checkbox"/>	<input type="checkbox"/>	
Programmed	<input type="checkbox"/>	<input type="checkbox"/>	

Designated Temperature Setpoints:

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Occupied:						
Cooling Setpoint °F	<u>72 +/- 1°</u>					
Heating Setpoint °F	<u>68 +/- 1°</u>					
Unoccupied:						
Cooling Setpoint °F	95					
Heating Setpoint °F	55					
Night Setback						
Setpoint °F	95/55					
CxA Note: Testing sequences may be conducted simultaneously where systems are connected or operate in conjunction with one another. This includes Chillers, Boilers, AHU's, TU's and Exhaust fans.						
Testing Sequence						
Variable Volume Air Handling Unit Sequence of Operation	Pass	Fail	Note			
Unit: VAV AHU #		-	-			
		-	-			
Fan Control		-	-			
When the air handling unit is requested to run, the BAS shall start the fan. A current switch shall prove status to the BAS and shall alarm at the central site if the switch is not made within 40 seconds (adjustable).		-	-			
		-	-			

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Cold Deck Temperature Control		-	-
When the air handling unit is in occupied mode and cooling is required, the BAS shall send a request for cooling to the chiller plant and shall modulate the chilled water control valve to maintain leaving air temperature set point (55 °F, adjustable).		-	-
			-
Air Volume Control		-	-
While the air handling unit is active, the BAS shall maintain the duct static pressure set point at 1.5" w.g. (adjustable) by modulating the speed of the supply fan through a variable speed drive (VSD). A static pressure sensor, mounted two-thirds down the longest duct run, shall monitor the duct static pressure. A manual-reset static pressure high limit switch, shall monitor the static pressure of the supply ducts. If the duct static pressure rises above 3.0" w.g. (locally adjustable) the air handling unit shall be de-energized via hard-wire interlock to the VFD safety circuit. The BAS shall monitor the high static limit switch and shall display an alarm at the central site. The static pressure high limit switch must be manually reset.		-	-
			-
Demand Control Ventilation		-	-
When the air handler is running in the occupied mode, the OA damper control shall be enabled. CO2 sensors mounted as indicated on drawings, shall monitor the CO2 levels. Where multiple sensors are provided for a particular AHU, the BAS shall select the highest level for control. The BAS shall modulate the outdoor air damper from its minimum position to its maximum position as required to maintain the CO2 level between 850 ppm and 1000 ppm (all adjustable). The OA dampers minimum and maximum positions shall be determined by the T.A.B. contractor to be the positions that allow the scheduled minimum and maximum OA CFM. The system shall have the ability to perform a "Purge Mode" at a scheduled time for a scheduled duration. The BAS will monitor Outside Airflow via the Airflow Monitoring Station.		-	-
			-

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Humidity Control		-	-
The BAS shall monitor humidity in 2 representative zones for each AHU. If either humidity transmitter senses humidity above 55% (adjustable), the BAS shall command 40% of the associated terminal units to 100% cooling (adjustable), and the terminal unit controller shall utilize the terminal unit reheat to maintain space setpoint.		-	-
		-	-
Auxiliary DX Cooling Coil (If Available)		-	-
The air handling unit serving the administration area shall be provided with an auxiliary DX cooling coil in addition to the hydronic coil. When the system is operating after hours, the BAS shall utilize the DX cooling for supply air temperature control and shall not send a request to the chiller plant.		-	-
		-	-
Reversed valve, DX coil not started up			-
Associated Equipment		-	-
During the occupied time period, any associated exhaust fans shall be energized.		-	-
		-	-
End of Testing			

END OF SECTION

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SECTION 23 09 25

VARIABLE FREQUENCY DRIVES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 23 00 00, apply to this Section.

1.2 SECTION INCLUDES

A. Variable Frequency Drive (VFD) and options including bypasses.

1.3 SCOPE OF WORK

A. This section provides specification for AC variable frequency drives or herein identified as VFD's for use with {NEMA B, NEMA D, NEMA A, NEMA E, Wound Rotor} design AC motors.

B. The VFD manufacturer shall furnish, test, adjust and certify all packages systems for satisfactory operation prior to shipment.

C. Any exceptions / deviations to this specification shall be indicated in writing and submitted.

1.4 RELATED SECTIONS

A. Section 23 00 00 - Basic Mechanical Requirements

B. Section 23 21 23 - Hydronic Pumps

1.5 REFERENCES

A. EN 61010-1 - Safety requirement for electrical equipment for measurement, control, and laboratory use. Part 1 - General Requirement.

B. EN 60204-1 - Safety of machinery-electrical equipment of machines. Part 1 - Specification for general requirement.

C. EN 60950 - Safety of information technology equipment including electrical business equipment.

D. IEC 664 - Insulation coordination for equipment within low-voltage systems.

E. IEC 60068-2-6 - Environmental testing - Part 2 - Test Fc: vibration (sinusoidal).

F. IEC 60068-2-27 - Environmental testing. Part 2: Tests. Test Ea and guidance: Shock

G. IEC 801-4 - Electrical Fast Transient (Supplementary Wave).

H. IEEE 519-2014 - Recommended Practice and Requirements for Harmonic Control in Electric Power Systems

I. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

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- 1 J. NEC - National Electrical Code
- 2
- 3 K. NEMA ICS6 - Industrial control and systems enclosures.
- 4
- 5 L. NEMA 250 - Enclosures for electrical equipment.
- 6
- 7 M. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- 8
- 9 N. NEMA FU1 - Low Voltage Cartridge Fuses.
- 10
- 11 O. NEMA ICS 7 - Industrial Control and Systems: Adjustable Speed Drives.
- 12
- 13 P. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation, and
- 14 Operation of Adjustable Speed Drive Systems.
- 15
- 16 Q. UL 508 - Industrial control equipment.
- 17
- 18 R. UL 61800-5-1
- 19
- 20 S. UL Type 1 or Type 12 - As listed in the contract documents.
- 21

22 1.6 SUBMITTALS

- 23
- 24 A. Provide submittal data on all items specified in this section in accordance with Specification
- 25 Section 23 00 90, General Conditions, and Division 1.
- 26
- 27 B. Product Data:
- 28 1. Provide as outlined in the contract documents previously issued:
- 29 a. General description, voltage, horsepower, max current ratings, diagrams.
- 30 b. Ratings and weights.
- 31
- 32 C. Shop Drawings:
- 33 1. Provide as outlined in the contract documents previously issued:
- 34 a. Outline dimensions.
- 35 b. Mounting points.
- 36 c. Interconnecting wiring diagrams.
- 37
- 38 D. Manufacturer's Installation Instructions:
- 39 1. Provide with each variable frequency drive at time of shipment and submittal:
- 40 a. Installation methods
- 41 b. Connection points
- 42
- 43 E. Submit product data for Variable Frequency Drive (VFD) with submittal package. Include
- 44 manufacturer, dimensions, ratings, listings, elementary power and control wiring diagrams and
- 45 data on features and components. Provide mounting points and connection points. Any
- 46 exceptions to the specification shall be clearly noted in the submittal.
- 47

48 1.7 QUALITY ASSURANCE

- 49
- 50 A. The VFD and options shall comply with the applicable requirements of the latest standards of
- 51 ANSI, IEEE, and the National Electrical Code.
- 52
- 53 B. The VFD and options shall be tested to ANSI/UL Standard 508 and listed by a nationally
- 54 recognized testing agency such as UL or ETL. Device shall bear label.
- 55

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- 1 C. To ensure quality and minimize infantile failures at the jobsite, the VFD shall be “burned in” for
2 24-hours by the manufacturer.
3
- 4 D. All VFD shall be UL listed for short circuit current rating of 65 kA and UL label shall be attached
5 accordingly.
6
- 7 E. All VFD system door mounted pilot devices shall be tested to verify successful operation.
8 Documentation shall be provided upon the request of the engineer.
9
- 10 F. All features shall be functionally tested at the factory for proper operation.

11
12 1.8 WARRANTY

- 13
- 14 A. VFD shall be free from defects in materials and workmanship under normal use and service
15 for a period of twenty-four (24) months from shipment.
16

17
18 PART 2 PRODUCTS

19
20 2.1 GENERAL

- 21
- 22 A. Manufacturers:
23 1. ABB
24 2. Danfoss
25 3. Yaskawa
26
- 27 B. Furnish complete variable speed drives as specified herein. All standard and optional features
28 requested shall be included within the VFD enclosure unless otherwise specified. Drives shall
29 be for variable torque load, unless otherwise noted.
30
- 31 C. The variable speed drives shall convert three-phase, 60 HZ utility power to adjustable voltage
32 and frequency, three-phase, AC power for step less motor speed control from 10% to 100%
33 of the motor's 60 Hz speed. Input voltage shall be as specified on the schedule.
34
- 35 D. The VFD power input stage shall convert three-phase AC line power to a fixed DC bus voltage.
36 This will be accomplished with a solid state three-phase full-wave diode rectifier with metal
37 oxide varistor (MOV) three-phase protection. Displacement power factor shall not be less than
38 0.95 throughout the speed range. Input line inductors (3%) shall be included on the line side
39 of the power input state for units that have saturating (non-linear) DC link reactors.
40
- 41 E. The VFD output power shall vary frequency to the motor from 6 to 60 Hz with resultant motor
42 speed varying at the motor nameplate rated speed, with output voltage variation from zero to
43 motor rated voltage for optimum volts per hertz (V/Hz) ratio for fan and pump loads. Output
44 current shall be rated 110% of motor full load amps (FLA) for 1 minute based upon VFD's
45 variable torque FLA rating. The output must be a voltage source type generating a sine coded
46 PWM waveform utilizing an asynchronous carrier frequency (output transistor switching
47 frequency is to be independent of drive output frequency). This carrier frequency shall be
48 adjustable to minimize harmonically induced noise or vibration.
49
- 50 F. All VFD shall contain integral EMI filters to attenuate radio frequency interference conducted
51 to the AC power line.
52
- 53 G. VFD shall minimize the audible motor noise through the use of an adjustable carrier frequency.
54 The carrier frequency shall be automatically adjusted to optimize motor and VFD operation
55 while reducing motor noise. VFDs with fixed carrier frequency are not acceptable.
56

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2.2 FEATURES

- A. The VFD shall include the following features:
 1. The VFD shall be housed in a NEMA 1 enclosure for indoor applications.
 2. The VFD shall be housed in a NEMA 3R enclosure for outdoor applications.
 3. The following display/control parameters shall be located on the front of the enclosure:
 - a. Hand/Off/Auto selector to start and stop the motor. In the auto position, the drive shall start/stop from a remote contact closure. In the auto position, motor speed shall be determined by the follower signal. In the manual position, motor speed shall be determined by manual adjustment.
 - b. Power on indication that the VFD is being supplied by the power line.
 - c. Fault indication that the VFD has tripped on a fault condition.
 - d. Display shall indicate load parameters such as load percent, frequency or running load amps.
 - e. A set of form C, dry contacts to indicate when the VFD is in the run mode.
 - f. A set of form C, dry contacts to indicate when the VFD is in the fault mode.
 - g. Terminations for safety interlocks such as freeze and smoke shut-down.
 - h. For a fault condition other than a ground fault, short circuit or internal fault, an auto restart function shall provide up to 6 programmable restart attempts. The time delay before restart attempts shall be a minimum of 30 seconds. This function permits automatic restarting after the drive controller detects a fault, provided that the other operating functions are correct, a run command is present, and the fault has disappeared. This shall be a function that is field selectable.
 - i. The VFD shall include a door interlocked, padlockable, input power disconnect switch.
- B. The following bypass features shall be included:
 1. Manual bypass shall provide all the circuitry necessary to transfer the motor from the VFD to the power line, or from the line to the controller.
 2. The AC Drive shall include mechanically and electrically interlocked isolation and bypass contactors, and AC line isolation contactor, complete with thermal overload relay, VFD/OFF/BYPASS switch and TEST/NORMAL selector switch.
 3. Motor overload protection shall be provided in both the controller mode and the bypass mode.
 4. The operator shall have full control of the bypass starter by operation of the VFD/OFF/BYPASS selector switch.
 5. In the automatic mode of operation, the isolation and bypass contactors shall be sequenced by the 110 volt rated auto start contact provided by user.
 6. A test/normal selector switch shall provide test operation of the power converter while operating the motor in bypass.
 7. A pilot light shall indicate whether motor is operating in drive or bypass mode.
- C. Speed Reference Input:
 1. Shall accept both a manual speed signal and a 0-10 VDC speed reference analog input signal from the Building Automation System (BAS). The input signal will generally be a temperature signal on single zone VAV applications or cooling tower control or a pressure signal on VAV applications.
- D. Feedback Signal:
 1. Provide 0-5 VDC or 0-20 mA analog output signal to indicate actual operating speed of VFD. Output signal shall be fed into the BAS.
- E. The VFD shall include a standard communications port and capabilities to be connected to the following serial communications protocols at no additional cost and without the need to install any additional hardware or software in the VFD.
 1. RS-485 for Modbus, N2, FLN, P1, and BACnet.

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- 2. Ethernet for Modbus/ TCP/IP and BACnet/ IP.
- 3. Lonwork FTP shall be available as an option for factory or field installation.

2.3 PROTECTIVE FEATURES

- A. The VFD shall include the following protective features:
 - 1. Protection against input transient voltage spikes.
 - 2. Minimum 65,000 A short circuit current rating for the VFD and enclosure
 - 3. Separate overload protection for each motor controlled.
 - 4. Protection against input power under voltage, over voltage, and phase loss.
 - 5. Protection against output current overload and over current.
 - 6. Protection against over temperature within the VFD enclosure.
 - 7. Protection against over voltage on the DC bus.
 - 8. DC bus discharge circuit for protection of service personnel.
 - 9. Insensitive to incoming power phase sequence.
 - 10. The number of restart attempts shall be adjustable from 0 to 20 and the time between attempts shall be adjustable between zero and 600 seconds. The original set-up shall be 4 restarts with 120 seconds between restarts.
 - 11. Four programmable critical frequency lockouts ranges to prevent the VFD from operating the load at a speed that causes vibration in the driven equipment.
 - 12. An automatic start delay may be selected from 0 to 120 seconds. During the start delay the VFD shall be programmed to provide either no voltage to the motor or apply DC braking current if desired.

2.4 ADJUSTMENTS

- A. The VFD shall include the following adjustments inside the enclosure:
 - 1. Maximum speed, adjustable 50-100% base speed.
 - 2. Minimum speed, adjustable 0-50% base speed.
 - 3. Acceleration time, adjustable 3 to 1800 seconds.
 - 4. Deceleration time, adjustable 3 to 1800 seconds with override circuit to prevent nuisance trips if deceleration time is set too short.
 - 5. Current limit, adjustable 0-100%.

2.5 SERVICE CONDITIONS

- A. The VFD shall be designed to operate within the following service conditions:
 - 1. Ambient temperature, 14°F to 113°F.
 - 2. 0 to 95% relative humidity, non-condensing.
 - 3. Elevation to 3,300 feet without derating.
 - 4. AC line voltage variation, -10% to +10% of nominal.
 - 5. No side clearance shall be required for cooling.
 - 6. All VFD shall be plenum rated.

PART 3 EXECUTION

3.1 INSTALLATION AND START UP SERVICE

- A. Variable frequency drives shall be provided by the mechanical contractor, installed by the electrical contractor, and controlled by the controls contractor.
- B. The manufacturer shall provide start up service by a factory trained service technician. The service technician shall verify correct installation, start up the drive, and check for proper operation.

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- 1 C. The VFD's shall be mounted and installed in accordance with all local, state, federal and NEC
- 2 codes.
- 3
- 4 D. Before and during the installation, the VFD shall be protected from site and environmental
- 5 contaminants. VFD's shall be stored as necessary in a clean and dry location.
- 6
- 7 E. Installation shall be in compliance with the manufacturer's instructions, drawings and
- 8 recommendations.
- 9
- 10 F. Start-up Assistance:
- 11 1. On-site assistance shall be available from a factory certified technical representative who
- 12 shall supervise the contractor's installation, testing and start-up of the VFD.
- 13 2. The start-up assistance shall be quoted as a separate line item.
- 14
- 15 G. Do not install VFD until building environment can be maintained in accordance with
- 16 manufacturer's instructions and requirements.
- 17

18 3.2 TRAINING

- 19
- 20 A. The manufacturer shall have regularly scheduled maintenance and training schools for the
- 21 equipment supplied and installed.
- 22
- 23 B. Training course shall be quoted as a separate line item with submittal.
- 24

25 END OF SECTION

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SECTION 23 21 13

HYDRONIC PIPING, VALVES, AND APPURTENANCES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 23 00 00, apply to this Section.

1.2 SECTION INCLUDES

- A. Hot and Chilled water piping
- B. Condenser water piping
- C. Chilled, hot, and condenser water valves
- D. Piping accessories and equipment

1.3 RELATED SECTIONS

- A. Section 22 05 24 - Valves
- B. Section 22 05 30 - Pipe and Pipe Fittings
- C. Section 23 00 00 - Basic Mechanical Requirements
- D. Section 23 05 19 - Meters and Gauges for HVAC Piping
- E. Section 23 05 93 - Testing, Adjusting and Balancing for HVAC
- F. Section 23 07 19 - Hydronic Piping Insulation
- G. Section 23 21 23 - Hydronic Pumps
- H. Section 23 52 33 - Water Tube Boilers

1.4 REFERENCES

- A. ASTM - American Society of Testing and Materials
- B. ASTM B-62-02 - Standard Specification for Composition Bronze or Ounce Metal Casting
- C. ASTM A126 (2014) - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
- D. ASTM A536-84 (2014) e1 - Standard Specification for Ductile Iron Castings
- E. ASTM B148-97 e1 - Standard Specification for Aluminum-Bronze Sand Castings
- F. ASTM B584-11 - Standard Specifications for Copper Alloy Sand Castings for General Applications

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- 1 G. ASTM A844-09/A844M-09 - Standard Specification for Steel Plates, 9% Nickel Alloy, for
2 Pressure Vessels, Produced by the Direct Quenching Process
3
- 4 1.5 SUBMITTALS
5
- 6 A. Provide submittal data on all items specified in this section in accordance with Specification
7 Section 23 00 00, General Conditions, and Division 1.
8
- 9 B. Submit product data on all piping materials, valves, piping accessories and equipment.
10
- 11 1.6 QUALITY ASSURANCE
12
- 13 A. All welders are to have certification. Furnish welder's certification prior to performing work.
14
15
- 16 PART 2 PRODUCTS
17
- 18 2.1 PIPING MATERIAL
19
- 20 A. Chilled and Hot Water Piping:
21 1. ½" through 2" - Type L hard drawn copper
22 2. 2½" and larger - Standard black steel pipe
23
- 24 B. All piping to meet ASTM 536-84.
25
- 26 2.2 FITTINGS
27
- 28 A. Chilled and Hot Water Piping:
29 1. ½" through 2" - Wrought copper sweat fittings.
30 2. 2½" and larger - Welded long-turn fittings and flanged connections.
31
- 32 B. 150 lb. ASA forged.
33
- 34 C. Dissimilar Metals require di-electric unions.
35
- 36 2.3 TRIPLE DUTY VALVES
37
- 38 A. Type:
39 1. Combination non-slam valve, throttling valve, shut-off valve and calibrated balancing
40 valve, backseating valve stem, NPT & flanged connections.
41
- 42 B. Materials:
43 1. Body:
44 a. NPT & flanged models - cast iron
45 b. Grooved models - ductile iron
46 2. Seat - Brass
47 3. Disc - Bronze with EPDM seat insert
48 4. Stem - Flanged & grooved models - stainless steel
49 5. Spring - Stainless steel
50 6. Packing - Teflon-Graphite
51

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- 1 C. Operating Pressure:
2 1. Maximum working pressure:
3 a. Cast iron models - 175 PSIG
4 b. Ductile iron models - 300 PSIG
5 2. Maximum operating temperature:
6 a. 250°F
7
8 D. Maximum Pressure Drop:
9 1. 2 PSIG across valve
10
11 E. Manufacturers:
12 1. Bell & Gossett
13 2. Armstrong
14 3. Mueller
15
16 F. Application:
17 1. Discharge side on all pumps
18
19 2.4 SUCTION DIFFUSERS
20
21 A. Type:
22 1. Straight or angle fitting, with pipe support foot, strainer orifice cylinder with start-up strainer
23 (#16 MESH Bronze) and permanent strainer, permanent magnet, horizontal service only.
24
25 B. Materials:
26 1. Body - NPT & Flanged Models - cast iron. Meets ASTM A126 or ASTM A536.
27 2. Cover - Grooved models - ductile iron
28 3. Straightening - X Models - Steel
29 4. Vanes - Z & Grooved Models - Stainless steel
30 5. Orifice - X Models - Steel
31 6. Cylinder - Z & Grooved Models - Stainless steel
32 7. Start Up Strainer - X, Z & Grooved Models - 16 Mesh Bronze
33 8. O Ring Seal - All Models - EPDM
34
35 C. Operating Pressures:
36 1. Maximum Working Pressure:
37 a. Cast iron models - 175 PSIG
38 b. Ductile iron models - Grooved system with flanged pump connection - 175 PSIG
39
40 D. Manufacturers:
41 1. Armstrong
42 2. Bell & Gossett
43
44 E. Application:
45 1. Suction side on all pumps. Install such that strainer is serviceable from horizontal position.
46
47 2.5 CHECK VALVES
48
49 A. 2 inch diameter pipe and smaller:
50 1. Type:
51 a. 300 pound CWP/150 pound SWP horizontal swing
52 2. Material:
53 a. Body - Bronze Y-Pattern
54 b. Seat - Bronze or TFE
55 c. Cap - Screwed
56 d. Connection - Screwed

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- 1 3. Manufacturer/Model:
2 a. Nibco T-433-B
3 b. Crane 141-TF
4 c. Jenkins 4092-J
5 d. Milwaukee 508
6
7 B. Larger than 2 inch diameter:
8 1. Type:
9 a. No slam globe style check.
10 b. 200 pound CWP
11 2. Material:
12 a. Body - Cast iron
13 b. Hanger, disc and seat ring - Cast bronze
14 c. Seat and disc - Renewable
15 d. Connection - Flanged
16 3. Manufacturer/Model:
17 a. Nibco F-910-B
18 b. APCO Series 600
19 c. Combination Pump & Valve # 20-D
20 d. Milwaukee 1800
21

22 2.6 GATE VALVES

- 23
24 A. Larger than 2 inch diameter:
25 1. Type:
26 a. 200 pound CWP OS & Y design
27 2. Material:
28 a. Body and bonnet - Cast iron
29 b. Wedge bushing, seat ring and wedge face ring - Cast bronze
30 c. Bonnet - Bolted
31 d. Wedge - Solid
32 e. Connections - Flanged
33 3. Manufacturer/Model:
34 a. Nibco F-617-0
35 b. Crane 465 1/2
36 c. Jenkins 454-J
37 d. Milwaukee 2885-A
38 4. Application:
39 a. ON/OFF
40
41 B. All valves are to have insulated extension handles.
42

43 2.7 BALL VALVES

- 44
45 A. 2 Inch and smaller.
46 1. Type:
47 a. 150 pound CWP two piece design, full port
48 2. Material:
49 a. Body - ASTM B-584, Alloy 844, Bronze. Yellow brass with more than 15% zinc not
50 acceptable
51 b. Seat - TFE
52 c. Stem - Blowout-proof
53 d. Handle - 1/4 turn lever
54 e. Memory stop
55 3. Manufacturer/Model:
56 a. Nibco T-585-70-M

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- 1 b. Apollo 77-150 Series
2 c. Milwaukee BA-400
3 4. Application:
4 a. ON/OFF
5
6 B. Where piping is insulated, ball valves shall be equipped with 2-inch extended handles of non-
7 thermal conductive material. Also, provide a protective sleeve that allows operation of the
8 valve without breaking the vapor seal or disturbing the insulation. Supply with memory stops
9 which are fully adjustable after insulation is applied. Equal to Nibco Nib Seal handle.
10
11 2.8 CHEMICAL POT FEEDER (CLOSED SYSTEM FILTER FEEDER)
12
13 A. Type: Neptune DBF-5HP or equivalent
14
15 B. Stainless steel basket
16
17 C. 30 micron polypropylene felt filter bag
18
19 D. Filtered rate 100 gpm
20
21 E. 5 gallon capacity
22
23 F. Construction:
24 1. SAE 1020 stainless
25 2. Finished 20 coat epoxy
26 3. 150 PSI, 200°F
27
28 G. Furnish 6 extra bags per feeder provided.
29
30 H. Manufacturers:
31 1. Neptune
32 2. Efficiency Dynamics
33 3. Claypool Pump & Machinery Co.
34 4. Newton Chemical Pump Co.
35 5. Wingert
36
37 I. Location:
38 1. Across pumps and as recommended by manufacturer
39
40 2.9 BUTTERFLY VALVES
41
42 A. 2" - 12" diameter:
43 1. 200 PSI
44 2. Ductile iron ASTM A-536
45 3. Full lug body
46
47 B. Disc:
48 1. Aluminum Bronze ASTM B-148
49 2. Stainless Steel ASTM A-351
50
51 C. Stem and body seal:
52 1. 410SS and EPDM Rubber rated at 225 degrees F.
53
54 D. Collar bushing:
55 1. Brass
56

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- 1 E. Connection:
2 1. Flanged
3
4 F. 6" & smaller with 10 degree notched lever handle; 8" & larger with cast iron weatherproof gear
5 operator.
6
7 G. All valves shall be certified for bi-directional dead-end service without a downstream flange.
8
9 H. Manufacturers:
10 1. NIBCO #LD-2000 Series
11 2. DeZurik # BRS-C1-EPDM-BZ-S4 Series
12 3. Demco 2'-12" NE Series; 14" & larger NF-C Series
13
14 I. Application:
15 1. ON/OFF
16
17 2.10 CIRCUIT BALANCING VALVES
18
19 A. Type: Automatic flow control valve and accessories.
20
21 B. General:
22 1. Valve to have internal cartridge(s) that is preset to specific GPM flow rate. Body to have
23 arrow indicating flow direction. Accuracy to be $\pm 5\%$.
24 2. Operating range to be 2-45 PSI, 175 PSI working pressure, 250°F.
25 3. Provide pressure/temperature ports for flow verification rating.
26 4. Provide ID tag with model number, GPM, spring range and location.
27 5. Body to be brass or ductile iron. Valves 2-inch and smaller to be brass Y-body type
28 screwed ends, union, ball valve. Valves 2½- inch and larger to be flanged end, ductile
29 iron.
30
31 C. Manufacturers:
32 1. Nexus
33 2. Flo Design
34 3. Hays
35 4. Tour
36 5. Anderson
37 6. Griswall
38 7. Belimo
39
40 2.11 STRAINERS
41
42 A. Type:
43 1. 150 pound W.O.G., "Y" type, Mueller, Nibco
44
45 B. Material:
46 1. ASTM B-62 Bronze
47 2. ASTM A126, Class B cast iron
48
49 C. Connection:
50 1. Screwed
51
52 D. Screen:
53 1. Mesh size:
54 a. 20 by 20 or 0.045 inch perforation
55 b. Up to 2": #20 mesh screw

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- 1 c. 2½" - .63
2 d. 5" and up: 0.125
3
4 E. Material:
5 1. Brass or stainless steel
6
7 F. Application:
8 1. At coils, pumps, heating/cooling equipment
9 2. Automatic flow-control valves shall not be used on equipment where pressure
10 independent control valves are installed. Coordinate with control valve provider.
11
12 2.12 TEST PLUGS
13
14 A. Provide where indicated for temperature and/or pressure measurement.
15
16 B. Furnish Owner with 2 sets of suitable pressure and temperature gauges.
17
18 C. Solid brass with cap and gasket.
19
20 **D. Provide 6 extra plugs located by Test & Balance Contractor. Coordinate these with Test**
21 **and Balance Contractor.**
22
23 2.13 COMBINATION AIR ELIMINATOR AND DIRT SEPARATOR
24
25 A. Automatic, full flow coalescing type combination air eliminator and dirt separator shall be
26 fabricated steel, rated for 150 psig working pressure, stamped and registered in accordance
27 with ASME Section VIII, Division 1 for unfired pressure vessels, and include two equal
28 chambers above and below the inlet / outlet nozzles.
29
30 B. Unit shall be based upon system flow with pipe size as a minimum. In no case shall entering
31 velocity exceed 10 feet per second.
32
33 C. Unit shall include internal structured elements filling the entire vessel to suppress turbulence
34 and provide air elimination efficiency of 100% free air, 100% entrained air, and 99.6%
35 dissolved air at the installed location. Dirt separation efficiency shall be a minimum of 80% of
36 all particles 30 micron and larger within 100 passes. The elements must be fabricated by the
37 manufacturer and consist of a copper core tube with continuous wound copper wire medium
38 permanently attached and followed by a separate continuous wound copper wire permanently
39 affixed.
40
41 D. Each unit shall have a separate venting chamber to prevent system contaminants from
42 harming the float and venting valve operation. At the top of the venting chamber shall be an
43 integral full port float actuated brass venting mechanism.
44
45 E. Units shall include a side tap valve to flush floating dirt or liquids and for quick bleeding of
46 large amounts of air during system fill or refill.
47
48 F. Working Temperature:
49 1. Up to 240°F.
50
51 G. Manufacturer/Model:
52 1. Spirotherm
53 2. Armstrong
54 3. Thrush
55 4. Elbi
56 5. Wessels

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
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- 1 6. Bell & Gossett
2 7. American Wheatley
3
4 H. Location:
5 1. A straight run of horizontal piping on the suction side of pumps.
6
7 2.14 EXPANSION TANKS
8
9 A. Material:
10 1. Shell: Steel ASME Rated with Seal
11
12 B. Manufacturer
13 1. Armstrong
14 2. Thrush
15 3. Elbi
16 4. Wessels
17 5. Bell & Gossett
18 6. American Wheatley
19
20 C. Types:
21 1. Hanging: Armstrong AX Horizontal Diaphragm or equivalent
22 2. Floor Mount: Armstrong L Vertical Replaceable Bladder or equivalent
23
24 D. Location:
25 1. As shown on schematic and recommended by manufacturer
26
27 2.15 DUAL CONTROL VALVES
28
29 A. Type:
30 1. Reducing (fast-fill) valve and pressure relief valve in one pre-assembled unit.
31
32 B. Material:
33 1. Cast iron
34
35 C. Inlet & outlet size:
36 1. 1/2 inch diameter
37
38 D. Pressure:
39 1. Relief valve:
40 a. Factory preset: 30 psi
41 b. Delivery: 12 psi
42 2. Filling valve:
43 a. Initial: 45 psi
44
45 E. Features:
46 1. Adjustable filling valve pressure setting.
47 2. Built-in strainer.
48 3. Built-in back pressure check.
49 4. Time-saving thumbscrew adjustment.
50
51 F. Manufacturer/Model:
52 1. Amtrol 67F.
53

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- 1 2.16 BACKFLOW PREVENTER
- 2
- 3 A. Material:
- 4 1. Bronze.
- 5
- 6 B. Connections:
- 7 1. Screwed.
- 8
- 9 C. Equip with standard gate valves.
- 10
- 11 D. Manufacturer/Model:
- 12 1. Watts 909.
- 13
- 14 E. Provide access for testing all ports 6'-0" or lower AFF.
- 15

16
17 **PART 3 EXECUTION**

- 18
- 19 3.1 EQUIPMENT INSTALLATION
- 20
- 21 A. Provide valves, strainers, expansion tanks, air separators, air eliminators, and other
- 22 equipment shown on the plans, and as otherwise necessary for a complete operational,
- 23 maintainable, and reliable system.
- 24
- 25 B. Installation shall be in accordance with the plans, specifications, and manufacturer's
- 26 instructions.
- 27

28 3.2 ARRANGEMENT

- 29
- 30 A. All piping shall be run parallel to building lines and shall be arranged so as not to interfere with
- 31 removal of other equipment or devices nor to block access to doors, windows, manholes or
- 32 other access openings.
- 33
- 34 B. Piping shall be arranged so as to facilitate removal of tube bundles.
- 35
- 36 C. Piping shall be placed and installed so that there will be no interference with the installation of
- 37 the equipment, ducts, etc.
- 38
- 39 D. All piping shall be installed to ensure noiseless circulation.
- 40
- 41 E. All valves and specialties shall be placed to permit easy operation, maintenance and access.
- 42
- 43 F. All piping shall be erected and pitched to ensure proper draining.
- 44
- 45 G. All backflow preventers shall be installed with test ports lower than 6'-0" AFF.
- 46
- 47 H. Piping shall be installed so as to avoid liquid or air pockets throughout the piping system.
- 48
- 49 I. Eccentric reducers with flat side up shall be used wherever changes in pipe size would cause
- 50 an air trap.
- 51
- 52 J. Manual air vents shall be installed at all high points in chilled water and hot water heating
- 53 systems with piping to drains.
- 54
- 55 K. Drain valves - Install in all low points or traps in the piping system.
- 56

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L. Expansion and contraction of piping shall be provided by expansion loops, bends or expansion joints to prevent injury to connections, piping, equipment or the building.

3.3 SLOPE

A. Minimum slope of piping shall be in accordance with the following unless otherwise specifically shown on the drawings or specified.

Type of Piping or Fluid Conveyed	Length for System Component	One Inch Fall	Direction of Fall
Chilled Water	Runouts to Equipment or Risers	4 feet	Back to Mains
Chilled Water	Supply and Return Mains	40 feet	To Nearest Drain Valve

3.4 CLEANING AND FLUSHING OF PIPING SYSTEM

A. Remove all labels, dirt, paint, grease and stains from all piping and accessories installed under this Contract.

B. A temporary flushing connection shall be arranged for each section of piping.

C. Water required for flushing shall be furnished by the Contractor.

D. All temporary cross connections for flushing and drainage connection shall be furnished, installed and subsequently removed by the Contractor.

E. Flush the entire system of all cutting oil, slag, pipe debris using a 1-2% solution of sodium triphosphate for a minimum of forty-eight (48) hours under pressure. Repeat if necessary. Flush with clean water until clear.

F. Contact Owner to coordinate with Owner's chemical treatment contractor to verify that the system has been properly cleaned. Contract with Owner's chemical treatment to add required chemicals to system to prevent corrosion, etc.

G. All fan coil units and air handlers shall be connected such that flow bypasses the cooling and heating coils, automatic flow control valves and the control valves during this process.

H. After the system is properly cleaned, the Contractor shall properly connect the fan coil units and air handlers.

I. After system cleaning, open all strainers, remove screen and clean strainers and re-install.

J. Remove all air from system.

K. In filling the systems, be sure to vent in such a manner that the control valves cannot backfill, thus causing foreign matter to be introduced into the valve body.

3.5 WATER TREATMENT

A. No HVAC water treatment by District supplier. Contractor to provide shot feeders, flow indicators and taps for condenser water treatment system. Contractor to provide labor and chemical to clean and flush all piping system. Contractor to coordinate with treatment provider to be sure chemicals used are compatible with providers chemicals.

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- 1 3.6 TESTING
2
3 A. Apply a hydraulic pressure 1-1/2 times the operating pressure, 150 psig minimum, and
4 carefully check for leaks.
5
6 B. Repair all leaks and retest the system until proved watertight.
7
8 C. Clean strainers after start-up and before test and balance agency performs their work.
9
10

END OF SECTION

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
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SECTION 23 21 23

HYDRONIC PUMPS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 23 00 00, apply to this Section.

1.2 SCOPE

- A. Pumps for use in distributing hot and chilled water for space heating and cooling.

1.3 RELATED SECTIONS

- A. Section 22 05 24 - Valves
- B. Section 22 05 30 - Pipe and Pipe Fittings
- C. Section 23 00 00 - Basic Mechanical Requirements
- D. Section 23 05 19 - Meters and Gauges for HVAC Piping
- E. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
- F. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC
- G. Section 23 21 13 - Hydronic Piping, Valves, and Appurtenances

1.4 REFERENCES

- A. HI - Hydraulic Institute.
- B. ANSI - American National Standards Institute.
- C. OSHA - Occupational Safety & Health Administration.
- D. ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers.
- E. NEMA - National Electrical Manufacturers Association.
- F. UL - Underwriters Laboratories.
- G. ETL - Electrical Testing Laboratories.
- H. NEC - National Electric Codes.
- I. ISO - International Standards Organization.
- J. IEC - International Electrotechnical Commission.
- K. ASME - American Society of Mechanical Engineers

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1 1.5 SUBMITTALS
2
3 A. Provide submittal data on all items specified in this section in accordance with Specification
4 Section 23 00 00, General Conditions, and Division 1.
5

6 1.6 QUALITY ASSURANCE
7

- 8 A. All equipment or components of this specification section shall meet or exceed the
9 requirements and quality of the items herein specified, or as denoted on the drawings.
10
11 B. Ensure pump operation at specified system fluid temperatures without vapor binding and
12 cavitation, is non-overloading in parallel or individual operation, and operates to ANSI/HI
13 9.6.3.1 standard for Preferred Operating Region (POR) unless otherwise approved by the
14 engineer. The pump NPSH shall conform to the ANSI/HI 9.6.1-2012 standards for *Centrifugal
15 and Vertical Pumps for NPSH Margin*.
16
17 C. Ensure pump pressure ratings are at least equal to system's maximum operating pressure at
18 point where installed but not less than specified.
19
20 D. Equipment manufacturer shall be a company specializing in manufacture, assembly, and field
21 performance of provided equipment with a minimum of 20 years.
22
23 E. Equipment provider shall be responsible for providing certified equipment start-up. New pump
24 start-up shall be for the purpose of determining pump alignment, lubrication, voltage, and
25 amperage readings. All proper electrical connections, pump's balance, discharge and suction
26 gauge readings, and adjustment of head, if required. A copy of the start-up report shall be
27 made and sent to both the contractor and to the Engineer.
28

29 1.7 DELIVERY, STORAGE, AND HANDLING
30

- 31 A. Deliver materials to the site in such a manner as to protect the materials from shipping and
32 handling damage. Provide materials on factory provided shipping skids and lifting lugs if
33 required for handling. Materials damaged by the elements should be packaged in such a
34 manner that they could withstand short-term exposure to the elements during transportation.
35
36 B. Store materials in clean, dry place and protect from weather and construction traffic. Handle
37 carefully to avoid damage.
38
39 C. Use all means necessary to protect equipment before, during, and after installation.
40
41 D. All scratched, dented, and otherwise damaged units shall be repaired or replaced as directed
42 by the Architect/ Engineer.
43

44
45 PART 2 - PRODUCTS

46
47 2.1 MANUFACTURERS

- 48 A. Armstrong
49
50 B. Bell & Gossett
51
52 C. Aurora
53
54

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1 2.2 GENERAL
2

3 A. Furnish and install as scheduled and shown on plans, centrifugal pumps.

4 1. Motor:

- 5 a. Premium efficiency motors shall be of the horsepower and speed shown in the pump
6 schedule. Pumps requiring larger horsepower shall not be acceptable. Motor shall
7 be premium efficiency and totally non-overloading on the pump curve.
8 b. Motor shall meet NEMA specifications and shall be of the size, voltage and
9 enclosure called for on the plans.
10 c. Pump and motors shall be factory aligned.
11 d. It shall have heavy-duty grease-lubricated ball bearings, completely adequate for
12 the maximum load for which the motor is designed.
13 (1) Acceptable Motors: Century E-Plus 3, US Premium Efficiency, Reliance XE,
14 Baldor Super E or approved equivalent.

15 2. Base:

- 16 a. Entire pumping unit shall be mounted on a cast iron driprim base using cap screws.
17 Pumps shall not be secured with floor studs.

18 3. Efficiency:

- 19 a. Pump(s) shall meet or exceed the efficiency shown in the pump schedule.

20 4. NPSHR:

- 21 a. To ensure cavitation-free operation, each pump's NPSH Requirement must be low
22 enough to permit stable, continuous operation at 120% or greater of best design
23 point.

24 5. Noise:

- 25 a. Each pump shall be capable of continuous operation without producing noise in
26 excess of Hydraulic Institute and OSHA guidelines.

27 6. Test:

- 28 a. Each pump shall be factory hydraulically tested. It shall then be thoroughly cleaned
29 and painted with at least one coat of high-grade machinery enamel prior to shipment.
30

31 2.3 CENTRIFUGAL PUMPS
32

33 A. Split Coupled End-Suction Pumps:

- 34 1. Furnish and install pumps with capacities as shown on plans. The pumps shall be long
35 coupled, base mounted, single stage, end suction, vertical split case design, in cast iron
36 and stainless steel fitted, and specifically designed for quiet operation. Suitable standard
37 operations at 225°F and 175 PSIG working pressure or optional operations at up to 250°F
38 and 250 PSIG working pressures. Working pressures shall not be de-rated at
39 temperatures up to 250°F. The pump internals shall be capable of being serviced without
40 disturbing piping connections, electrical motor connections or pump to motor alignment.
41 2. The pumps shall be composed of three separable components: a motor, bearing
42 assembly, and pump end (wet end). The motor shaft shall be connected to the pump
43 shaft via a replaceable flexible coupling.
44 3. A bearing assembly shall support the shaft via two heavy-duty re-greaseable ball
45 bearings. Bearing assembly shall be replaceable without disturbing the system piping
46 and shall have foot support at the coupling end. Pump bearings shall be re-greaseable
47 without removal of the bearings from the bearing assembly. Thermal expansion of the
48 shaft toward the impeller shall be prevented via an inboard thrust bearing.
49 4. The bearing assembly shall have a solid SAE1144 steel shaft. A stainless steel shaft
50 sleeve shall be employed to completely cover the wetted area under the seal.

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- 1 5. Pump shall be equipped with an internally-flushed mechanical seal assembly installed in
2 an enlarged tapered seal chamber. Application of an internally flushed mechanical seal
3 shall be adequate for seal flushing without requiring external flushing lines. Seal
4 assembly shall have Buna bellows and seat gasket, stainless steel spring, and be of a
5 carbon ceramic design with the carbon face rotating against a stationary ceramic face.
- 6 6. Bearing assembly shaft shall connect to a bronze impeller. Impeller shall be both
7 hydraulically and dynamically balanced to ANSI/HI 9.6.4-2009, balance grade G6.3 and
8 secured by a bronze locking capscrew or nut.
- 9 7. Pump should be designed to allow for true back pull-out allowing access to the pump's
10 working components, without disturbing motor or piping, for ease of maintenance.
- 11 8. A center drop-out type coupling, capable of absorbing torsional vibration, shall be
12 employed between the pump and motor. Pumps for variable speed application shall be
13 provided with a suitable coupling sleeve. Coupling shall allow for removal of pump's
14 wetted end without disturbing pump volute or movement of the pump's motor and
15 electrical connections. On variable speed applications the coupling sleeve should be
16 constructed of a neoprene material to maximize performance life.
- 17 9. An ANSI and OSHA rated coupling guard shall shield the coupling during operation.
18 Coupling guard shall be dual rated ANSI B15.1 and OSHA 1910.219 compliant coupling
19 guard and contain viewing windows for inspection of the coupling. No more than .25
20 inches of either rotating assembly shall be visible beyond the coupling guard.
- 21 10. Pump volute shall be of a cast iron design with integrally cast pedestal volute support,
22 rated for 175 PSIG with integral cast iron flanges drilled for 125# ANSI companion
23 flanges. (Optional 250 PSIG working pressures are available and are 250# flange drilled.)
24 Volute shall include gauge ports at nozzles, and vent and drain ports.
- 25 11. Base plate shall be of structural steel or fabricated steel channel configuration fully
26 enclosed at sides and ends, with securely welded cross members and fully open grouting
27 area (for field grouting). The minimum base plate stiffness shall conform to ANSI/HI
28 1.3.8.2.1- 2009 for grouted Horizontal Baseplate Design standards.
- 29 12. Pump shall be of a maintainable design and, for ease of maintenance, should use
30 machine fit parts and not press fit components.
- 31 13. The pump(s) vibration limits shall conform to Hydraulic Institute ANSI/HI 9.6.4-2009 for
32 recommended acceptable unfiltered field vibration limits (as measured per ANSI/HI 9.6.4-
33 2009 Figure 9.6.4.2.3.1) for pumps with rolling contact bearings.
- 34 14. Pump manufacturer shall be ISO-9001 certified.
- 35 15. Each pump shall be hydrostatically tested 1.5 times the maximum rated working pressure
36 and name-plated before shipment.
- 37 16. Pump shall conform to ANSI/HI 9.6.3.1-2012 standard for Preferred Operating Region
38 (POR) unless otherwise approved by the engineer.

39
40 **B. Vertical In-Line:**

- 41 1. The pumps shall be close-coupled, inline for vertical or horizontal installation, in cast iron
42 stainless steel fitted construction specifically designed for quiet operation. Suitable
43 standard operations at 225°F and 175 PSIG working pressure (or optional operations at
44 up to 250°F and 250 PSIG working pressures). Working pressures shall not be de-rated
45 at temperatures up to 250°F. The pump internals shall be capable of being serviced
46 without disturbing piping connections.
- 47 2. As an option an EPR/Carbon/Tungsten/Carbide/SS seal (250°F maximum operating
48 temperature), FKM/Carbon/Ceramic/SS seal, or EPR-Silicon Carbide/Silicon Carbide/SS
49 seal may be used in lieu of the standard Buna/Carbon/Ceramic/SS seal (225° F
50 maximum operating temperature).
- 51 3. The pumps shall have a solid alloy steel shaft that is integral to the motor. A non-ferrous
52 shaft sleeve shall be employed to completely cover the wetted area under the seal.
- 53 4. The motor bearings shall support the shaft via heavy-duty grease lubricated ball bearings.

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- 1 5. Pump shall be equipped with an internally flushed mechanical seal assembly installed in
- 2 an enlarged tapered seal chamber. Seal assembly shall have a stainless steel housing,
- 3 Buna bellows and seat gasket, stainless steel spring, and be of a carbon ceramic design
- 4 with the carbon face rotating against a stationary ceramic face.
- 5 6. Pump shaft shall connect to a bronze impeller. Impeller shall be hydraulically and
- 6 dynamically balanced to Hydraulic Institute Standards ANSI/HI 9.6.4.5-2000. The
- 7 allowable residual imbalance conforms to ANSI grade 6.3, keyed to the shaft and secured
- 8 by a bronze locking cap screw or nut.
- 9 7. Pump should be designed to allow for true back pull-out access to the pump's working
- 10 components for ease of maintenance.
- 11 8. Pump volute shall be of a Class 30 cast iron design rated for 175 PSIG with integral cast
- 12 iron flanges drilled for 125# ANSI companion flanges (Optional 250 and 300 PSIG
- 13 working pressures are available and are 250# flange drilled). Volute shall include gauge
- 14 ports at nozzles, and vent and drain ports. The volute shall be designed with a base ring
- 15 matching an ANSI 125# flange that can be used for pump support.
- 16 9. Pumps shall conform to ANSI/HI 9.6.3.1 standard for Preferred Operating Region (POR)
- 17 unless otherwise approved by the engineer.
- 18 10. Pump shall be of a maintainable design and for ease of maintenance should use machine
- 19 fit parts and not press fit components.
- 20 11. Pump manufacturer shall be ISO-9001 certified.
- 21 12. Each pump shall be factory tested and name-plated before shipment.
- 22 13. As an option, the pump may include an internal stainless steel casing wear rings.
- 23 14. Where noted on schedule pumping equipment may require one or all of the following
- 24 optional tests: Certified Lab tests (unwitnessed), Hydraulic Institute Level B tests, or
- 25 Witnessed Tests.

26
27 2.4 ACCESSORIES

- 28
- 29 A. Provide one mechanical seal for each model type of primary pump.
- 30
- 31 B. Pumps shall be provided with internal volute wear rings, galvanized drip pan, or special spacer
- 32 couplings.
- 33
- 34

35 PART 3 EXECUTION

36
37 3.1 INSTALLATION

- 38
- 39 A. All components shall be installed in accordance with manufacturer's installation instructions.
- 40
- 41 B. Reduction from line size to pump connection size shall be made with eccentric reducers
- 42 attached to the pump with tops flat to allow continuity of flow.
- 43
- 44 C. Furnish and install triple duty valves on the discharge side of all pumps and furnish and install
- 45 a line size shut-off valve on the suction side of all pumps. Anywhere that 5 straight pipe
- 46 diameters of pipe cannot be provided on the inlet side of a pump a suction diffuser shall be
- 47 used to provide appropriate flow distribution into the eye of the pump's impeller.
- 48
- 49 D. Provide temperature and pressure gauges where and as detailed or directed.
- 50
- 51 E. On systems where pump seals require flushing water or cooling water for a heat exchanger
- 52 kit, provide cooling water supply piping and connections as well as the return piping, if
- 53 required. Piping should be of adequate size to pass required flow rate.
- 54
- 55 F. Proper access space around a device should be left for servicing the component. No less than
- 56 the minimum recommended by the manufacturer.

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- 1 G. Provide an adequate number of isolation valves for service and maintenance of the system
2 and its components.
3
- 4 H. On systems where the final balancing procedure requires the triple duty valve to be throttled
5 more than 25% to attain design flow (on a constant speed pumping system), and no future
6 capacity has been built into the pump, the pump impeller must be trimmed to represent actual
7 system head resistance. The pump provider and engineer of record, based on the balancing
8 contractor's reports, shall determine the final impeller trim diameter.
9
- 10 I. Each pump shall have at minimum a 4" housekeeping pad.
- 11
- 12 J. Install foot mounted and base mounted pumps on a vibration isolation pad, which will be set
13 on top of the housekeeping pad. Set, level and grout. Install non-shrinking grout under pumps.
14
- 15 K. All piping shall be brought to equipment and pump connections in such a manner so as to
16 prevent the possibility of any loads of stresses being applied to the connections or piping. All
17 piping shall be fitted to the pumps even though piping adjustments may be required after the
18 pipe is installed.
19
- 20 L. On components that require draining, contractor must provide piping to and discharging into
21 appropriate drains.
22
- 23 M. Provide drains for bases and seals, piped to and discharging into floor drains.
24
- 25 N. Power wiring, as required, shall be the responsibility of the electrical contractor. All wiring shall
26 be performed per manufacturer's instruction and applicable state, federal, and local codes.
27
- 28 O. Control wiring for remote mounted switches and sensor / transmitters shall be the
29 responsibility of the control's contractor. All wiring shall be performed per manufacturer's
30 instructions and applicable state, federal, and local codes.
31
- 32 P. The pumps shall be installed at the locations shown and as detailed on the plans and in other
33 sections of these specifications.
34
- 35 Q. The mechanical contractor shall clean the strainers and suction diffusers after the system has
36 been flushed and on a regular basis until the pumps are turned over to the Owner.
37
- 38 R. Pump and motor shall be realigned by the contractor according to the standards of the
39 Hydraulic Institute after grouting of base and connection of piping.
40
- 41 S. Each pump shall be checked by the contractor and regulated for proper differential pressure,
42 voltage and amperage draw. This data shall be noted on a permanent tag or label and fastened
43 to the pump for Owner's reference.
44
45

END OF SECTION

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
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SECTION 23 52 16

CONDENSING BOILERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 01 Specifications and Section 23 00 00, apply to this Section.

1.2 SECTION INCLUDES

- A. Natural gas-fired, condensing hot water aluminum boilers for use in providing hot water for space heating.

1.3 REFERENCES

- A. Texas Department of Labor Boiler Rules and Regulations.

1.4 RELATED SECTIONS

- A. Section 23 00 00 - Basic Mechanical Requirements
- B. Section 23 05 19 - Meters and Gauges for HVAC Piping
- C. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC
- D. Section 23 21 13 - Hydronic Piping, Valves, and Appurtenances

1.5 WARRANTY

- A. The boiler manufacturer shall warrant each boiler, including boiler, trim, boiler control system, and all related components, accessories, and appurtenances against defects in workmanship and material for a period of twelve (12) months from date of startup. Heat exchanger and fuel burner shall be warranted for a period of ten (10) years from date of shipment.

1.6 REFERENCES

- A. Refer to Section 23 00 00 for complete names of references identified in this section.
 - AGA American Gas Association
 - GAMA Gas Appliance Manufacturers Association
 - ASME The American Society of Mechanical Engineers
 - NFPA National Fire Protection Association
 - ANSI American National Standards Institute
 - Texas Boiler Law

1.7 SUBMITTALS

- A. Product Data:
 - 1. Provide submittal data on all equipment specified in this section in accordance with Section 23 00 90, General Conditions, and Division 01.
 - 2. Submit product data indicating typical catalog of information including arrangements.
 - 3. Submit product data sheets indicating dimensions, general assembly, and materials used in fabrication.

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- 1 4. Indicate mechanical and electrical service locations and requirements.
- 2 5. Submit manufacturer's installation instructions.
- 3
- 4 B. Shop Drawings:
- 5 1. Submit 1/4" per foot shop drawing(s) showing all ducts, piping, and equipment shown by
- 6 plans and specifications. Submit drawings on all mechanical rooms. The drawings shall
- 7 be coordinated with structural and electrical. Provide sections for all congested areas and
- 8 mechanical rooms.
- 9

10
11 **PART 2 PRODUCTS**

12
13 2.1 **MANUFACTURERS**

- 14 A. Lochinvar
- 15
- 16 B. Patterson-Kelley
- 17
- 18 C. Raypak
- 19

20
21 2.2 **COMPONENTS**

- 22 A. Heat Exchanger
- 23 1. Heat exchangers that consist of a primary and secondary heat exchanger are not
- 24 acceptable.
- 25 2. Near condensing boilers not acceptable.
- 26 3. Each hot water boiler shall consist of a stainless steel heat exchanger complete with trim,
- 27 valve trains, burner, and boiler control system. The boiler manufacturer shall fully
- 28 coordinate the boiler as to the interaction of its elements with the burner and the boiler
- 29 control system in order to provide the required capacities, efficiencies, and performance
- 30 as specified.
- 31 4. The boiler heat exchanger shall be stainless steel that is suitable to resist the corrosive
- 32 gases produced from flue gas condensation. The casting shall be a counter-flow design
- 33 for maximum heat transfer with the multiple flow paths arranged in a reverse return
- 34 configuration to assure balanced flow through each channel. Each section shall be an
- 35 independent vessel connected together on the water side by a common manifold without
- 36 the inclusion of pin-nipples and/or water-side gaskets or may be of a Mono-Block design
- 37 in lieu of sectional design.
- 38 5. Each boiler shall be capable of operating with a minimum outlet water temperature of
- 39 68°F.
- 40
- 41 B. Main Gas Train and Combustion Chamber
- 42 1. Each boiler shall be provided with an integral main gas valve train. The main gas valve
- 43 train(s) shall be factory assembled, piped, and wired. Each gas valve train shall include
- 44 at least the following:
- 45 a. One (1) manual shutoff valve.
- 46 b. Two (2) safety solenoid valves. Valves equipped with dual solenoids that can be
- 47 independently energized for leak testing and must be integrated into a single body
- 48 design.
- 49 c. Air-Gas ratio control (maximum inlet pressure 14" W.C.).
- 50 d. One (1) low gas pressure switch (manual reset).
- 51 e. One (1) high gas pressure switch (manual reset) as required by code.
- 52 f. Two (2) pressure test ports.
- 53 2. If gas pressure exceeds 14" W.C. the Contractor shall supply a suitable intermediate
- 54 lockup type gas pressure regulator to reduce the pressure to acceptable levels.
- 55

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- 1 3. The boiler manufacturer shall furnish each boiler with an integral power type fuel burner.
2 The fuel burner shall be an assembly of a gas burner, combustion air blower, valve train,
3 and ignition system. The burner manufacturer shall fully coordinate the burner as to the
4 interaction of its elements with the boiler heat exchanger and the boiler control system in
5 order to provide the required capacities, efficiencies, and performance as specified.
6 4. Each burner shall be located near the top of combustion chamber with combustion gases
7 flowing downward through the heat exchanger and constructed of stainless steel flange
8 with perforated stainless steel inner backing plate and stainless steel outer knit.
9 5. A condensate collection box shall be employed to trap and neutralize flue product
10 condensate.
11 6. Each boiler shall be equipped with direct spark ignition. Main flame shall be monitored
12 and controlled by a flame rod (rectification) system.
13 7. **At minimum, selected boiler shall be capable of a 10:1 turndown.**
14
- 15 C. BOILER SAFETY and TRIM DEVICES
16 1. Boiler safety and trim devices shall be as follows:
17 a. Safety relief valve shall be provided in compliance with the ASME code.
18 b. Water pressure/temperature gauge.
19 c. Low Water/Flow cutoff.
20 d. Adjustable high limit water temperature controller with manual reset.
21 e. Operating temperature control to control the sequential operation of the burner.
22 f. High and Low Gas Pressure switches as required.
23 g. Flame rod (rectification) system.
24
- 25 D. BOILER CONTROL SYSTEM
26 1. Each boiler shall be provided with all necessary controls, all necessary programming
27 sequences, and all safety interlocks. Each boiler control system shall be properly
28 interlocked with all safeties.
29 2. Each boiler shall be provided with a "Full Modulating" firing control system whereby the
30 firing rate is infinitely proportional at any firing rate between 10% and 100% as determined
31 by the pulse width modulation input control signal. Both fuel input and air input must be
32 sequenced in unison to the appropriate firing rate without the use of mechanical linkage.
33 3. Control system shall provide the minimum capabilities:
34 a. Maintain single set point
35 b. Reset the set point based on outdoor air temperature.
36 c. Boiler shutdown based on outdoor air temperature.
37 d. Internal dual set point program with an external point of closure with time of day /
38 night setback.
39 e. Alarm relay for any manual reset alarm function.
40 f. Programmable Low Fire Delay to prevent short cycling based on a time and
41 temperature factor for release to modulation.
42 g. 7" (seven) touchscreen text display showing current supply and return temperatures,
43 current set points as well as differential set points. It must also display any fault
44 codes whether automatically reset or manually reset.
45 h. Local Manual Operation.
46 i. Cascade control for external control source.
47 j. Remote Control System (Building Management/Sequencer Control) - The boiler
48 control shall be capable of accepting a 0 to 10vdc remote external analog signal to
49 control the temperature setpoint.
50 k. On board Domestic Hot Water Priority capable of changing from the heating pump
51 to the DHW pump as well as changing the boiler set point from a heating temperature
52 to a higher set point temperature to satisfy the DHW system and then return to the
53 heating mode.
54 l. Domestic Hot Water may run concurrent with Comfort Heat mode.

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- 1 m. All equipment shall be provided with necessary communication capabilities and
- 2 hardware to allow integration with Mod-Bus Communications with building
- 3 Automation System (provided by others.)
- 4 n. Interface for LONWORKS® and BacNet® must be available.
- 5 o. Rep Information Screen: Boiler control shall provide screen for local representative's
- 6 contact information.
- 7 p. Alarms: Boiler control shall provide on-screen instructions for correcting alarms.
- 8 q. Setup Wizard: Boiler control shall feature an intuitive setup wizard which allows the
- 9 user to setup the operating conditions with a series of questions and images.
- 10 r. Configurable Outputs: Boiler control shall feature four configurable relay outputs.
- 11 These relays can be configured by the user to control circulating pumps, control
- 12 valves, air dampers, etc.
- 13 s. Configurable Information Menu: Boiler control shall have the ability to show or hide
- 14 read-only information so the display can be customized to show only the most
- 15 important information to the operator.
- 16 t. Sliding Menus: Boiler control shall feature a touch-screen user interface which
- 17 allows the user to slide vertically through menus, information lists, etc.
- 18

19 **PART 3 EXECUTION**

20
21 **3.1 INSTALLATION**

- 22
- 23 A. Provide a factory startup report by the boiler supplier. Startup report shall be made and
- 24 delivered to the mechanical engineer and the test and balance agency. The following items
- 25 shall be noted and recorded. Temperature settings by stages, High limit, Inlet water
- 26 temperature, Outlet water temperature, Delta t, Gas pressure Inches WC unit on, unit off, Type
- 27 of gas, Manifold gas pressures at each gas valve, Air pressure at combustion air blower, Type
- 28 of venting, draft readings unit on, unit off, supply water settings and name of reporting person.
- 29 1. Installation shall be performed by the contractor in accordance with the requirements of
- 30 the applicable codes. Contractor shall review the boiler and installation for compliance
- 31 with requirements and/or issues that may affect boiler performance. Installation should
- 32 not proceed until unsatisfactory conditions have been corrected.
- 33
- 34 B. Equipment Mounting:
- 35 1. Install boilers on cast-in-place 4" concrete equipment base.
- 36
- 37 C. Install gas-fired boilers according to NFPA 54, ANSI Z223.
- 38
- 39 D. Assemble and install boiler trim.
- 40
- 41 E. Install electrical devices furnished with boiler but not specified to be factory mounted.
- 42
- 43 F. Install control wiring to field mounted electrical devices.
- 44
- 45 G. Install and connect condensation neutralization system for each boiler.
- 46
- 47 H. Hardwire interlock each boiler to carbon monoxide (CO) sensor.
- 48
- 49 I. Residential type boilers with a required near-boiler primary circulation pump will not be
- 50 allowed.
- 51

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3.2 CONNECTIONS

A. Piping

1. Each boiler shall be provided with all necessary inlet and outlet connections. Refer to specific Boiler's specification sheet for connection sizes.
2. Check Manufacturer's Installation Manual for clearance dimensions and install piping that will allow for service and ease of maintenance.
3. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection and adhere to proper codes for neutralization.

B. Exhaust Venting

1. Flue system shall be double wall stainless steel with termination kit.
2. Install flue venting system per manufacturer's recommendations and state/provincial codes.

END OF SECTION

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INTEGRATED AUTOMATION

DIVISION 25

25 00 00 General Requirements for Integrated Automation

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SECTION 25 00 00

GENERAL REQUIREMENTS FOR INTEGRATED AUTOMATION

1.1 GENERAL:

- A. The control system shall consist of a high-speed, peer-to-peer network of DDC controllers and a web-based operator interface. The facility shall be integrated into the existing Automated Logic Galena Park ISD District Wide Energy Management Server. All energy data, food service monitoring, lighting controls and BAS HVAC alarms shall be provided and commissioned as per district standards. Depict each mechanical system and building floor plan by a point-and-click graphics. A web server with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network.
- B. Operators shall be able to perform all normal operator functions through the web browser interface. If individual software seat licenses or keys are required provide a minimum of 4 additional licenses to accommodate multiple owner operators.
- C. Manufacturer shall provide a web-based BAS platform; the installing contractor shall provide the new web-based software and software updates required for this project. Additionally the installing contractor shall provide all computer related components (BAS web server – reference specifications for hardware requirements) for the new software platform to function in a peer-to- peer environment.
- D. The system shall directly control HVAC equipment as specified in Sequences of Operation. Each zone controller shall provide occupied and unoccupied modes of operation by individual zone. Furnish energy conservation features such as optimal start and stop, night setback, request-based logic, and demand level adjustment of set points.
- E. System shall use the BACnet protocol for communication to the operator workstation or web server and for communication between control modules.
 - 1. System Performance
- F. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation (server and browser for web-based systems).
- G. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.
- H. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.
- I. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 15 sec.
- J. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 sec. Select execution times consistent with the mechanical process under control.
- K. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.

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- 1 L. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5
- 2 sec of other workstations.
- 3
- 4 M. Reporting Accuracy. System shall report values with minimum end-to- end accuracy listed in
- 5 Table 1.
- 6
- 7 N. Control Stability and Accuracy. Control loops shall maintain measured variable at set point
- 8 within tolerances listed in Table 2.
- 9

TABLE 1: REPORTING ACCURACY	
Measured Variable	Reported Accuracy
Space Temperature	±0.5°C (±1°F)
Ducted Air	±0.5°C (±1°F)
Outside Air	±1.0°C (±2°F)
Dew Point	±1.5°C (±3°F)
Water Temperature	±0.5°C (±1°F)
Delta-T	±0.15°C (±0.25°F)
Relative Humidity	±3% RH
Water Flow	±2% of full scale
Airflow (terminal)	±10% of full scale (see Note 1)
Airflow (measuring stations)	±5% of full scale
Airflow (pressurized spaces)	±3% of full scale
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Water Pressure	±2% of full scale (see Note 2)
Electrical (A, V, W, Power Factor)	±1% of reading (see Note 3)
Carbon Monoxide (CO)	±5% of reading
Carbon Dioxide (CO 2)	±50 ppm

- 1. Note 1: 10% - 100% of scale
- 2. Note 2: For both absolute and differential pressure
- 3. Note 3: Not including utility-supplied meters

TABLE 2: CONTROL STABILITY AND ACCURACY		
Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±50 Pa (±0.2 in. w.g.) ±3 Pa (±0.01 in. w.g.)	0-1.5 kPa (0-6 in. w.g.) -25 to 25 Pa (-0.1 to 0.1 in. w.g.)
Airflow	±10% of full scale	
Space Temperature	±1.0°C (±2.0°F)	
Duct Temperature	±1.5°C (±3°F)	
Humidity	±5% RH	
Fluid Pressure	±10 kPa (±1.5 psi) ±250 Pa (±1.0 in. w.g.)	MPa (1-150 psi) 0-12.5 kPa (0-50 in. w.g.) differential

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COMMON WORK RESULTS FOR INTEGRATED AUTOMATION

A. Refer to other subsections within 25 00 00

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- 1 25 06 00 SCHEDULES FOR INTEGRATED AUTOMATION
2
3 A. Provide schedule in construction documents for any low voltage lighting controls
4 integration.
5
- 6 25 08 00 COMMISSION OF INTEGRATED AUTOMATION
7
- 8 A. Provide Control System Checkout and Testing
9 1. Complete startup testing to verify operational control system before notifying
10 Owner of system demonstration. Provide Owner with schedule for startup testing.
11 Owner may have representative present during any or all startup testing.
12 2. Calibrate and prepare for service each instrument, control, and accessory
13 equipment furnished under building controls package.
14 3. Verify that control wiring is properly connected and free of shorts and ground
15 faults. Verify that terminations are tight.
16 4. Enable control systems and verify each input device's calibration. Calibrate each
17 device according to manufacturer's recommendations.
18 5. Verify that binary output devices such as relays, solenoid valves, two- position
19 actuators and control valves, and magnetic starters, operate properly and that
20 normal positions are correct.
21 6. Verify that analog output devices such as I/Ps and actuators are functional, that
22 start and span are correct, and that direction and normal positions are correct.
23 Check control valves and automatic dampers to ensure proper action and closure.
24 Make necessary adjustments to valve stem and damper blade travel.
25 7. Prepare a log documenting startup testing of each input and output device, with
26 technician's initials certifying each device has been tested and calibrated.
27 8. Verify that system operates according to sequences of operation. Simulate and
28 observe each operational mode by overriding and varying inputs and schedules.
29 Tune PID loops and each control routine that requires tuning.
30 9. Alarms and Interlocks.
31 a. Check each alarm with an appropriate signal at a value that will trip the alarm.
32 b. Trip interlocks using field contacts to check logic and to ensure that actuators
33 fail in the proper direction.
34 10. Test interlock actions by simulating alarm conditions to check initiating value of
35 variable and interlock action.
36 11. Provide and submit a "check-out/start-up" report prior to scheduling any
37 demonstrations or functional testing.
38
- 39 B. Control System Demonstration
40 1. Prior to acceptance, perform the following performance tests to demonstrate
41 system operation and compliance with specification after and in addition to tests
42 specified in (Control System Checkout and Testing). Provide
43 Engineer/Commissioning Agent with log documenting completion of startup tests.
44 2. Engineer or Commissioning Agent will be present to observe and review system
45 demonstration. Notify A/E and commissioning teams at least 10 days before
46 system demonstration begins.
47 3. Demonstration shall follow process submitted and approved. Complete approved
48 checklists and forms for each system as part of system demonstration.
49 4. Demonstrate actual field operation of each sequence of operation. Provide at
50 least two persons equipped with two-way communication. Demonstrate
51 calibration and response of any input and output points requested by Engineer/
52 Commissioning agent.
53 5. Provide and operate test equipment required to prove proper system operation.
54 6. Demonstrate compliance of system performance.
55 7. Demonstrate compliance with sequences of operation through each operational
56 mode.

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8. Demonstrate complete operation of operator interface.
 9. Demonstrate each of the following.
 - a. DDC loop response. Supply graphical trend data output showing each DDC loop's response to a setpoint change representing an actuator position change of at least 25% of full range. Trend sampling rate shall be from 10 seconds to 3 minutes, depending on loop speed. Each sample's trend data shall show setpoint, actuator position, and controlled variable values. Engineer will require further tuning of each loop that displays unreasonably under- or over-damped control.
 - b. Demand limiting. Supply trend data output showing demand- limiting algorithm action. Trend data shall document action sampled each minute over at least a 30-minute period and shall show building kW, demand-limiting setpoint, and status of setpoints and other affected equipment parameters.
 - c. Building fire alarm system interface.
 - d. Trend logs for each system. Trend data shall indicate setpoints, operating points, valve positions, and other data as specified in the points list provided with each sequence of operation.
 - e. Full lighting controls interface including interlocks with other building systems.
 10. Tests that fail to demonstrate proper system operation shall be repeated after Contractor makes necessary repairs or revisions to hardware or software to successfully complete each test. Due to failed tests, Commissioning agent will request additional items to be tested as needed to complete the commissioning of the control system.
- C. Acceptance
1. After tests described in this specification are performed to the satisfaction of both Engineer and Owner/commissioning agent, owner will accept control system as meeting completion requirements. Engineer may exempt tests from completion requirements that cannot be performed due to circumstances beyond Contractor's control. Engineer will provide written statement of each exempted test. Exempted tests shall be performed as part of warranty.
 2. System shall not be accepted until completed demonstration forms and checklists are submitted and approved.
- D. Cleaning
1. Each day clean up debris resulting from work. Remove packaging material as soon as its contents have been removed. Collect waste and place in designated location.
 2. On completion of work in each area, clean work debris and equipment. Keep areas free from dust, dirt, and debris.
 3. On completion of work, check equipment furnished under this section for paint damage. Repair damaged factory-finished paint to match adjacent areas. Replace deformed cabinets and enclosures with new material and repaint to match adjacent areas.
- E. Training
1. The contractor shall provide training to owner personnel in a laboratory classroom environment. Each student shall be provided with a dedicated computer workstation utilizing a simulated BAS software platform that is installed for this project. The instructor's shall have CEU accreditation for all training courses offered. Provide documentation for this requirement in the initial BAS submittal. If contractor does not have CEU instructor or offer these courses locally include cost for tuition, travel and boarding to send students to manufacturer training facility. The owner shall not incur any additional cost for training classes as listed below for the first 3 years. The following training courses shall be conducted for

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- 1 4 individuals on 4 separate occasions each year for a 3-year period (12 classes
2 total) following substantial completion:
3 a. Operator Overview – Consists of general system navigation, scheduling
4 functions, setpoint modifications and parameter adjustments.
5 b. Advanced Topics Overview – Detailed analysis of trend setup/configuration,
6 trend historian, alarm setup, alarm actions (email, printing, etc.), point
7 renaming, and detailed analysis of equipment parameters.
8 c. Program/Logic Manipulation – Modify system programs as needed for
9 additions and modifications.
10 d. Graphic Manipulation – Modify system graphics as needed for additions and
11 modifications.
12 e. Hardware Troubleshooting – Classroom setup shall have HVAC mock-up
13 systems. Operators shall be able to interact with this live system through the
14 BAS utilized for this project. Class will provide students the ability to identify
15 and repair common problems regularly encountered.
16 f. Software Troubleshooting - Classroom setup shall have HVAC mock- up
17 systems. Operators shall be able to interact with this live system through the
18 BAS utilized for this project. Class will provide students the ability to identify
19 and repair common issues that can be utilized via software modifications.
20 g. Central Plant Operation – At a minimum the instructor shall thoroughly
21 explain different types of central plant equipment and proper system
22 modifications that can be made to enhance system performance and energy
23 savings.
24 h. HVAC System Training – Objective of this class is to provide basic HVAC
25 system knowledge of various types of systems including types of air side
26 distribution and water side distribution. Topics such as thermodynamics,
27 psychometrics, de- humidification, and demand control ventilation shall be
28 thoroughly explained.
29

30 25 14 00 INTEGRATED AUTOMATION LOCAL CONTROL UNITS

31
32 A. General

- 33 1. Provide Building Controllers (BC), Advanced Application Controllers (AAC),
34 Application Specific Controllers (ASC), and Smart Actuators (SA) as required
35 to achieve performance specified in Section 15900.
36 a. Article 1.9 (System Performance).
37

38 B. BACnet:

- 39 1. Building Controllers (BCs). Each BC shall have demonstrated interoperability
40 during at least one BMA Interoperability Workshop and shall substantially
41 conform to BACnet Building Controller (B-BC) device profile as specified in
42 ASHRAE/ANSI 135-2001, BACnet Annex L.
43 2. Advanced Application Controllers (AACs). Each AAC shall conform to BACnet
44 Advanced Application Controller (B-AAC) device profile as specified in
45 ASHRAE/ANSI 135-2001, BACnet Annex L and shall be listed as a certified B-
46 AAC in the BACnet Testing Laboratories (BTL) Product Listing.
47 3. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet
48 Application Specific Controller (B-ASC) device profile as specified in
49 ASHRAE/ANSI 135-2001, BACnet Annex L and shall be listed as a certified B-
50 ASC in the BACnet Testing Laboratories (BTL) Product Listing.
51 4. Smart Actuators (SAs). Each SA shall conform to BACnet Smart Actuator (B-
52 SA) device profile as specified in ASHRAE/ANSI 135- 2001, BACnet Annex L
53 and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL)
54 Product Listing.

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- 5. BACnet Communication:
 - a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
 - b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
 - c. Each AAC and ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
 - d. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
 - C. Communication:
 - 1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.
 - 2. Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.
 - 3. Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.
 - 4. Stand-Alone Operation. Each piece of equipment shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.
 - D. Environment:
 - 1. Controller hardware shall be suitable for anticipated ambient conditions.
 - 2. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at - 29°C to 60°C (-20°F to 140°F).
 - 3. Controllers used in conditioned space shall be mounted in dust- protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
 - E. Real-Time Clock:
 - 1. Controllers that perform scheduling shall have a real-time clock.
 - F. Serviceability:
 - 1. Controllers shall have diagnostic LEDs for power, communication, and processor.
 - 2. Wires shall be connected to a field-removable modular terminal strip or to a termination card connected by a ribbon cable.
 - 3. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.
 - G. Memory:
 - 1. Controller memory shall support operating system, database, and programming requirements.
 - 2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.
 - 3. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.

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- 1 H. Immunity to Power and Noise:
- 2 1. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and
- 3 shall perform an orderly shutdown below 80% nominal voltage. Operation shall
- 4 be protected against electrical noise of 5 to 120 Hz and from keyed radios up to
- 5 5 W at 1 m (3 ft).
- 6
- 7 I. Transformer:
- 8 1. ASC power supply shall be fused or current limiting and shall be rated at a
- 9 minimum of 125% of ASC power consumption.

10 25 35 00 INTEGRATED AUTOMATION INSTRUMENTATION & TERMINAL DEVICES FOR HVAC

- 11 A. Motorized Control Dampers
- 12 1. Type: Control dampers shall have linear flow characteristics and shall be parallel-
- 13 or opposed-blade type as specified below or as scheduled on drawings.
- 14 a. Outdoor and return air mixing dampers and face-and-bypass dampers shall
- 15 be parallel-blade and shall direct airstreams toward each other.
- 16 b. Other modulating dampers shall be opposed-blade.
- 17 c. Two-position shutoff dampers shall be parallel- or opposed- blade with blade
- 18 and side seals.
- 19 2. Frame: Damper frames shall be 2.38 mm (13 gauge) galvanized steel channel or
- 20 3.175 mm (1/8 in.) extruded aluminum with reinforced corner bracing.
- 21 3. Blades: Damper blades shall not exceed 20 cm (8 in.) in width or 125 cm (48 in.)
- 22 in length. Blades shall be suitable for medium velocity (10 m/s [2000 fpm])
- 23 performance. Blades shall be not less than 1.5875 mm (16 gauge). manufacturer
- 24 for application, oil impregnated sintered bronze, or better.
- 25 4. Seals. Blade edges and frame top and bottom shall have replaceable seals of
- 26 butyl rubber or neoprene. Side seals shall be spring-loaded stainless steel. Blade
- 27 seals shall leak no more than 50 L/s·m² (10 cfm per ft²) at 1000 Pa (4 in. w.g.)
- 28 differential pressure. Blades shall be airfoil type suitable for wide- open face
- 29 velocity of 7.5 m/s (1500 fpm).
- 30 5. Sections. Damper sections shall not exceed 125 cm - 150 cm (48 in. - 60 in.).
- 31 Each section shall have at least one damper actuator.
- 32 6. Linkages. Dampers shall have exposed linkages.
- 33
- 34 B. Electric Damper and Valve Actuators
- 35 1. Stall Protection. Mechanical or electronic stall protection shall prevent actuator
- 36 damage throughout the actuator's rotation.
- 37 2. Spring-return Mechanism. Actuators used for power-failure and safety
- 38 applications shall have an internal mechanical spring-return mechanism or an
- 39 uninterruptible power supply (UPS).
- 40 3. Signal and Range. Proportional actuators shall accept a 0-10 Vdc or a
- 41 a. 0-20 mA control signal and shall have a 2-10 Vdc or 4-20 mA operating
- 42 range.
- 43 4. Wiring. 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring.
- 44 5. Manual Positioning. Operators shall be able to manually position each actuator
- 45 when the actuator is not powered. Non-spring-return actuators shall have an
- 46 external manual gear release. Spring-return actuators with more than 7 N·m (60
- 47 in.-lb) torque capacity shall have a manual crank.
- 48
- 49 C. Control Valves
- 50 1. General. Select body and trim materials in accordance with manufacturer's
- 51 recommendations for design conditions and service shown.
- 52 2. Type. Provide two- or three-way control valves for two-position or modulating
- 53 service as shown.
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- D. Water Valves
 1. Valves providing two-position service shall be quick opening. Two-way valves shall have replaceable disc or ball.
 2. Close-off (Differential) Pressure Rating. Valve actuator and trim shall provide the following minimum close-off pressure ratings: Two-way: 100% of total system (pump) head, Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.
 3. Ports: Valves providing modulating service shall have equal % ports.
 4. Sizing: Two-position service: line size, Two-way modulating service: select pressure drop equal to the greatest of twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or 35 kPa (5 psi), Three-way modulating service: select pressure drop equal to the smaller of twice the pressure drop through the coil exchanger (load) or 35 kPa (5 psi).
 5. Fail Position: Water valves shall fail normally open or closed as follows unless otherwise specified. Water zone valves: normally closed, Heating coils in air handlers: normally closed, Chilled water control valves: normally open and Other applications: as scheduled or as required by sequences of operation.
 - E. Binary Temperature Devices
 1. Low-Voltage Space Thermostats: Low-voltage space thermostats shall be 24 V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.
 2. Line-Voltage Space Thermostats: Line-voltage space thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap- switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 13°C- 30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.
 3. Low-Limit Thermostats: Low-limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.
 - F. Temperature Sensors
 1. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor.
 2. Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m 2(10 ft 2) of duct cross-section.
 3. Immersion sensors shall have a separable stainless steel well. Well pressure rating shall be consistent with system pressure it will be immersed in. Well shall withstand pipe design flow velocities.
 4. Space sensors shall have setpoint adjustment, override switch, display, and communication port as shown.
 5. Differential sensors shall be matched sensors for differential temperature measurement.
 - G. Humidity Sensors
 1. Duct and room sensors shall have a sensing range of 20%-80%.
 2. Duct sensors shall have a sampling chamber.
 3. Outdoor air humidity sensors shall have a sensing range of 20%-95% RH and shall be suitable for ambient conditions of 40°C-75°C (40°F- 170°F).
 4. Humidity sensors shall not drift more than 1% of full scale annually.
 5. Flow Switches

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6. Flow-proving switches shall be paddle (water service only) or differential pressure type (air or water service) as shown. Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).
 7. Paddle switches shall have adjustable sensitivity and NEMA 1 enclosure unless otherwise specified.
 8. Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.
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- H. Relays
1. Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.
 2. Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable $\pm 100\%$ from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.
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- I. Override Timers
1. Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0-6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.
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- J. Current Transmitters
1. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4-20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be $\pm 1\%$ full-scale at 500 ohm maximum burden.
 2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.
 3. Unit shall be split-core type for clamp-on installation on existing wiring. Current Transformers
 4. AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.
 5. Transformers shall be available in various current ratios and shall be selected for $\pm 1\%$ accuracy at 5 A full-scale output.
 6. Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.
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- K. Voltage Transmitters
1. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4-20 mA output with zero and span adjustment.
 2. Adjustable full-scale unit ranges shall be 100-130 Vac, 200-250 Vac, 250-330 Vac, and 400-600 Vac. Unit accuracy shall be $\pm 1\%$ full-scale at 500 ohm maximum burden.
 3. Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.
- 51
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- L. Voltage Transformers
1. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.
 2. Transformers shall be suitable for ambient temperatures of 4°C-55°C (40°F-130°F) and shall provide $\pm 0.5\%$ accuracy at 24 Vac and 5 VA load.

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- 1 3. Windings (except for terminals) shall be completely enclosed with metal or
2 plastic.
3
- 4 M. Power Monitors
5 1. Power monitors shall be three-phase type and shall have three-phase
6 disconnect and shorting switch assembly, UL listed voltage transformers, and
7 UL listed split-core current transformers.
8 2. Power monitors shall provide selectable output: rate pulse for kWh reading or 4-
9 20 mA for kW reading. Power monitors shall operate with 5 A current inputs and
10 maximum error of $\pm 2\%$ at 1.0 power factor or $\pm 2.5\%$ at 0.5 power factor.
11
- 12 N. Current Switches
13 1. Current-operated switches shall be self-powered, solid-state with adjustable
14 trip current. Select switches to match application current and DDC system
15 output requirements.
16
- 17 O. Pressure Transducers
18 1. Transducers shall have linear output signal and field-adjustable zero and span.
19 2. Continuous operating conditions of positive or negative pressure 50% greater
20 than calibrated span shall not damage transducer sensing elements.
21 3. Water pressure transducer diaphragm shall be stainless steel with minimum
22 proof pressure of 1000 kPa (150 psi). Transducer shall have 4-20 mA output,
23 suitable mounting provisions, and block and bleed valves.
24 4. Water differential pressure transducer diaphragm shall be stainless steel with
25 minimum proof pressure of 1000 kPa (150 psi). Over-range limit (differential
26 pressure) and maximum static pressure shall be 2000 kPa (300 psi.) Transducer
27 shall have 4-20 mA output, suitable mounting provisions, and 5- valve manifold.
28
- 29 P. Differential Pressure Switches
30 1. Differential pressure switches (air or water service) shall be UL listed, SPDT
31 snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and
32 differential suitable for intended application and NEMA 1 enclosure unless
33 otherwise specified.
34
- 35 Q. Pressure-Electric (PE) Switches
36 1. PE switches shall be UL listed, pilot duty rated (125 VA minimum) or motor
37 control rated, metal or neoprene diaphragm actuated, operating pressure rated
38 for 0-175 kPa (0-25 psig), with calibrated scale minimum setpoint range of 14-
39 125 kPa (2-18 psig).
40 2. Provide one- or two-stage switch action (SPDT, DPST, or DPDT) as required
41 by application.
42 3. Switches shall be open type (panel-mounted). Exception: Switches shall be
43 enclosed type for remote installation. Enclosed type shall be NEMA 1 unless
44 otherwise specified.
45 4. Each pneumatic signal line to PE switches shall have permanent indicating
46 gauge.
47
- 48 R. Local Control Panels
49 1. Indoor control panels shall be fully enclosed NEMA 1 construction with hinged
50 door key-lock latch and removable sub-panels. A common key shall open each
51 control panel and sub-panel.
52 2. Prewire internal and face-mounted device connections with color- coded
53 stranded conductors tie-wrapped or neatly installed in plastic troughs. Field
54 connection terminals shall be UL listed for 600 V service, individually identified
55 per control and interlock drawings, with adequate clearance for field wiring.

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- 1 3. Each local panel shall have a control power source power switch (on- off) with
2 overcurrent protection.
3
- 4 25 36 00 INTEGRATED AUTOMATION INSTRUMENTATION & TERMINAL DEVICES FOR
5 ELECTRICAL SYSTEMS
6
- 7 A. Provide a building electric meter that will send an analog signal representative of the
8 building KW usage to the B.A.S. Through the B.A.S. control module, the building
9 meter shall integrate the input and calculate the buildings KWH usage. The B.A.S.
10 control module shall show the current usage, monthly usage, year-to-date usage, and
11 time and date of the highest peak demand for the month and year. Demand thresholds
12 may be set to adjust set points and shed loads in order to reduce peak consumption.
13 The usage data shall be sent to the server and stored to be used by the Districts M-
14 Power energy tracking system. The building meter shall monitor for surges and record
15 such surges and notify operator of surges.
16
- 17 25 38 00 INTEGRATED AUTOMATION INSTRUMENTATION & TERMINAL DEVICES FOR
18 ELECTR4ONIC SAFETY AND SECURITY SYSTEMS
19
- 20 A. No special considerations
21
- 22 25 51 00 INTEGRATED AUTOMATION CONTROL OF FACILITY EQUIPMENT
23
- 24 A. Energy Efficiency Education Dashboard (EEED)
25
- 26 B. Controls contractor shall provide an Energy Efficiency Education Dashboard (EEED)
27 interactive display. It shall be the responsibility of Integrated Automation Controls
28 contractor to develop the graphics, screens and associated software to accomplish
29 the features listed in this narrative.
30
- 31 C. The Eco-Screen is an interactive tool to help educate the public on the green features
32 and energy efficiency of a facility. It uses the information gathered by the building
33 automation system to display the energy consumption and conditions of the facility.
34 Its dynamic graphics provide an exciting and powerful way to showcase the “hidden”
35 systems within a facility. It also helps to inform the public about green buildings and
36 sustainability.
37
- 38 D. The system shall feature easy to recognize icons that help user navigate through each
39 category with ease. Other features shall include tabs that show Usage, Comparisons,
40 Ways to Save, Learn More, How it Works, weather and facility information:
41 1. The “Usage” tab shows the historical consumption of that type of energy as well
42 as the current demand. The date range for this information can be easily selected
43 by clicking the calendar icons. The Chart can be displayed as a line graph or bar
44 chart.
45 2. The “Compare” tab is used to show how many or much of a common item it would
46 take to equal the historical usage.
47 3. The “Ways to Save” tab shows the different things the user can do to save that
48 type of energy.
49 4. The “Learn More” tab goes further by pointing out additional interesting facts
50 about that type of energy.
51 5. The “How it Works” feature shows the details of the mechanical systems, cooling
52 system and Photo-Voltaic Solar Cells. These animated graphics help the user to
53 learn how these systems work by dividing the systems into easy to understand
54 parts and explaining the functionality and purpose.

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- 1 6. The “Weather” icon shows current weather conditions and a two-day forecast. On
- 2 sites with their own weather station, detailed information from the system is
- 3 displayed.
- 4 7. The “School Information” icon is a feature that is used to highlight the local district
- 5 and campus news and information. This can be displayed in a static bill board
- 6 type screen or linked to the local campus web site.

7
8 25 54 00 INTEGRATED AUTOMATION CONTROL OF PLUMBING

- 9
- 10 A. Provide a meter to be installed by plumbing contractor that will monitor natural gas
- 11 usage for review by energy management. Monitoring shall include the volume of gas
- 12 used per month (user adjustable time duration) total usage and alarm if excessive
- 13 flow.

14 25 55 00 INTEGRATED AUTOMATION CONTROL OF HVAC

- 15
- 16
- 17 A. Communications with Third Party Equipment
- 18
- 19 B. Any additional integral control systems included with the products integrated with the
- 20 work of this section shall be furnished with a BACnet interface for integration into the
- 21 Direct Digital Control System described in this section (reference sequence of
- 22 operations and points list for specifics). Those systems include:
- 23 1. Boilers
- 24
- 25 C. Irrigation controls
- 26

27 25 56 00 INTEGRATED AUTOMATION CONTROL OF ELECTRICAL SYSTEMS

- 28
- 29 A. Any additional integral control systems included in the electrical systems shall be
- 30 furnished with a BACnet interface for integration into the Direct Digital Control
- 31 Systems. Those systems include switchgear and low voltage lighting control system.
- 32
- 33 B. Provide a building electric meter that will send an analog signal representative of the
- 34 building KW usage to the B.A.S. Through the B.A.S. control module, the building
- 35 meter shall integrate the input and calculate the buildings KWH usage. The B.A.S.
- 36 control module shall show the current usage, monthly usage, year-to-date usage, and
- 37 time and date of the highest peak demand for the month and year. Demand thresholds
- 38 may be set to adjust set points and shed loads in order to reduce peak consumption.
- 39 The usage data shall be sent to the server and stored to be used by the Districts M-
- 40 Power energy tracking system. The building meter shall monitor for surges and record
- 41 such surges and notify operator of surges.
- 42
- 43 C. Transient Voltage Surge Suppression (TVSS) equipment and any line filtering
- 44 equipment shall be monitored.
- 45

46 25 58 00 INTEGRATED AUTOMATION CONTROL OF ELECTRONIC SAFETY AND SECURITY
47 SYSTEMS

- 48
- 49 A. Discuss interlocks of the building automation system to other low voltage systems such
- 50 as the security system, lighting controls and walk-in cooler/freezers with the Owner.
- 51

52 25 95 00 INTEGRATED AUTOMATION CONTROL SEQUENCES FOR HVAC

- 53
- 54 A. HEATING WATER SYSTEM
- 55 1. Building HW supply temperature - AI
- 56 2. Building HW return temperature - AI

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3. Boiler HW supply temperature, each boiler – AI
 4. HW pump status – current switch, each pump - DI
 5. Boiler status – dry contacts, each boiler- DI
 6. Boiler enable, each boiler – DO
 7. HW Pump enable, each pump – DO
 8. Heating Water System Activation
 9. The heating water system shall be activated by a request for heating from any equipment it supplies with heating water. The number of heating requests required and the length of time the requests must be received before activating the plant shall be operator adjustable. The heating water system shall be disabled if the outside air temperature is greater than 65°F (operator adjustable) unless heating water is required for dehumidification.
 10. When the heating water system is active a heating water pump shall be enabled. When the HWP is commanded to run a current switch shall prove status to the B.A.S., which shall alarm at the central site if the switch is not made within 20 seconds (adjustable). There shall also be a 10 second (adjustable) de-bounce time to prevent nuisance alarms from a bouncing switch.
 11. Whenever the heating water system is deactivated, the hot water pump shall continue to run for 3 minutes (adjustable) to avoid excessive temperature buildup in the boiler.
 12. The operator shall have the ability to disable any boiler in software which will remove it for the sequence and prevent it from being enabled via the B.A.S.
 13. If the hot water supply temperature is less than 100°F (adjustable) or a HWP status is not indicating a hot water pump is running the B.A.S. control module shall broadcast that hot water is not available.

B. Heating Water System Control

1. After the hot water pumping system status has been proven, the BAS shall send a signal to enable the lead boiler to fire. A contact in each boiler control panel shall provide status to the B.A.S. The hot water set point shall be reset based on the outdoor air temperature between 140°F (adjustable) when the outdoor air is at 25°F and 110°F (adjustable) when the outdoor air temperature is 60°F. The BAS control module shall vary the percent load of the condensing and non-condensing boilers to maintain the HW supply set point.
2. After an initial start-up delay of fifteen (15) minutes (adjustable), if the building HW supply temperature is not less than set point by more than 5°F (adjustable) and the building HW return temperature is greater than 100°F (adjustable) for eight (8) minutes (adjustable) a boiler shall be disabled.
3. Once a boiler is disabled the B.A.S. shall delay of fifteen (15) minutes (adjustable) and if the above criteria are met then another boiler shall be disabled.
4. Once boilers have been disabled, if the building HW supply temperature is less than set point by more than 5°F (adjustable) or the building HW return temperature is less than 100°F (adjustable) for five (5) minutes (adjustable) the next boiler in sequence shall be enabled. Once a boiler is enabled the B.A.S. shall delay of fifteen (15) minutes (adjustable) and if the above criteria are met then another boiler shall be enabled until all of the boilers are enabled.
5. The above boiler enable/disable sequence shall continue match the correct number of boilers to the building load.
6. Low temperature control valves, supplied with the non- condensing boilers, shall modulate to ensure each boilers hot water return temperature is maintained at least 110°F.

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- 1 C. Freeze Protection
2 1. When the outdoor air temperature drops to 34°F (adjustable) or below, the BAS
3 shall open the hot water valves for flow through the coils for freeze protection. The
4 hot water system shall be activated to run and the building HW supply set point
5 shall be set to 85°F (adjustable) while running the condensing boiler only until the
6 low ambient temperature ceases to exist or the building start-up time arrives.
7

- 8 D. OUTDOOR AIR CONDITIONS
9 1. Outdoor air temperature – AI
10 2. Outdoor air humidity – AI
11 3. The sensors shall be mounted in an area on the North side of the building where
12 the representative temperature and humidity can be monitored, both shall have
13 sun shields. Based on the outside air temperature and humidity the B.A.S. shall
14 calculate the outdoor enthalpy, wet bulb, and dew point temperatures. The
15 outdoor air temperature and humidity shall be broadcast as global information for
16 use by the other control programs.
17

18 25 96 00 INTEGRATED AUTOMATION CONTROL SEQUENCES FOR ELECTRICAL SYSTEMS
19

- 20 A. *For each GPISD project, whether new or existing project, a “Lighting control” meeting
21 shall be held.
22

- 23 B. Existing Buildings:
24 1. The extent of lighting controls is determined based on project requirements.
25 LVLCS or lighting contactors may be used.
26 2. Control of lighting contactors or LVLCS shall be incorporated into the existing
27 building management system “head end” to be accessed, monitored and
28 programmed through existing energy management computers/equipment.
29 3. Where classroom lighting is replaced, provide dual level lighting controlled through
30 local switches that are enabled through line voltage occupancy sensors. Layout
31 lighting in “checker board” pattern paying particular attention to location of
32 projector and projector screen.
33 4. Incorporate new building design as much as possible.
34 5. Existing line voltage switches may remain in use but will be enabled by LVLCS or
35 contactors. Determined through lighting control meeting with GPISD.
36 6. Provide interlocks with systems as noted in “New facility” design.
37 7. Override switches:
38 a. Shall be a programmable input to the LVLCS or building management system.
39 b. Shall be Sargent brand switches with interchangeable cores.
40 c. Located in custodian office.
41 d. Located in principal’s office.
42 e. Located at each security system key pad
43 f. Shall be adjustable in time duration.
44 g. Provide an “exterior lighting” override switch in main electrical room.
45 h. All override switches shall have engraved wall plates.
46

- 47 C. MISCELLANEOUS LIGHTING CONTROL REQUIREMENTS:
48 1. For areas with clerestory or floor-ceiling windows, provide a day light harvesting
49 scenario. Not necessarily a high tech dimming system.
50 2. Provide a lighting control schedule on drawings. This schedule shall list the
51 lighting circuits to be controlled by relay and the groups in which the relays
52 belong. For example:
53

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Lighting Circuit	Relay	Control Group
HA-1	LCA-1	A (interior)
HB-13,15,17	LCB-1 (contactor coil)	Ext (parking light)

OR

Lighting Circuits	Control group
HA-1, HA-3, HB-5, HC-6	A
HB-13, 15, 17	Ext (Teacher’s lot night light)

3. Responsibility matrix for BAS contractor, is as follows:

Description	Division 25	Division 26
Engineering & Design	Furnish	Review
Submittals	Furnish	Review

Equipment:		
Relay Panels with Relays	Furnish & Install	X
Distributed Lighting Controllers	Furnish & Install	X
Digital Switches	Furnish & Install	X
Standard Switches	X	Furnish & Install
Ceiling Mount Motion Occupancy Sensors	Furnish & Install	X
Wall Mount Motion Occupancy Sensors	Furnish & Install	X
Network Repeaters	Furnish & Install	X
Light Level Sensors	Furnish & Install	X
Digital Input Modules	Furnish & Install	X
Override Switches	Furnish & Install	X
Distributed Lighting Controller Power Wiring	Furnish & Install	X
Relay Panel Power Wiring	X	Furnish & Install
All Low Voltage Wiring	Furnish & Install	X
Programming	Furnish	X
Graphics	Furnish	X
Start Up & Commissioning	Furnish	Assist

D. Lighting sequence of operation:

1. Control groups
 - a. 50% of lighting in common areas, 50% of lighting in corridors. Lighting circuits for locker rooms, kitchen, custodian office, gang restrooms, gyms, fine arts area and administration area (areas occupied at times after normal school hours).
 - b. The remaining 50% of common areas, corridors etc.
 - c. Switch leg that controls the normal switching of emergency lighting (through GTD devices).
 - d. North side security lighting.
 - e. South sec. lighting

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- 1 f. East sec. lighting.
- 2 g. West sec. lighting.
- 3 h. Staff parking 50%.
- 4 i. Staff parking 50%
- 5 j. Staff parking nightlight.
- 6 (1) Three control groups for each parking lot.
- 7 k. Marquee sign
- 8 l. Canopies
- 9 2. Separate each parking lot into different control groups based on the size of the lot.
- 10 In each parking group there is a 50% level and a night light circuit.
- 11 3. Wall packs and soffit lighting (security lighting) to be separated by the direction
- 12 building faces. Circuiting is broken up to north, west, east and south.
- 13 4. When security system is armed all interior lights go out, A, B and C. Exterior groups
- 14 H, I and L off 15 minutes (adj) after security system is armed.
- 15 5. When security is tripped all lighting groups are "on".
- 16 6. When security is disarmed AND the time is between 7:30 am and 5:00 pm, all lights
- 17 on, A, B and C.
- 18 7. When security is disarmed AND the time is between 5:01 pm and 7:29 am, group A
- 19 and C are on, group B is off.
- 20 8. When security is disarmed or armed, all exterior lights will operate according to
- 21 schedule.
- 22 9. When fire alarm is tripped, all lighting groups are "on".
- 23
- 24

END OF SECTION

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ELECTRICAL

DIVISION 26

26 00 00	Electrical
26 00 30	Warranty Period
26 00 90	Electrical Submittal Procedures
26 05 11	Electrical Demolition
26 05 19	Low-Voltage Electrical Power Conductors and Cables
26 05 26	Grounding and Bonding for Electrical Systems
26 05 33.11	Raceways and Conduits for Electrical Systems
26 05 33.13	Boxes and Fittings for Electrical Systems
26 05 53	Identification for Electrical Systems
26 08 00	Commissioning of Electrical Systems
26 08 11	Testing of Electrical System
26 09 16	Electrical Control Components
26 28 16	Enclosed Safety Switches and Circuit Breakers
26 43 00	Surge Protective Devices (SPD)

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SECTION 26 00 00

ELECTRICAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Bidding requirements, contract forms, conditions of the contract, Division 1 - General Requirements apply to work of this division.

1.2 SECTION INCLUDES

- A. Furnishing of all materials, equipment, tools, scaffolding, labor and transportation required for the complete installation of the electrical systems as shown on the drawings and as specified herein.
- B. Bidders shall determine the contents of a complete set of drawings and specifications and be aware that they may be bidding from a partial set of drawings, applicable only to the various separate contracts, subcontracts, or trades as may be issued for bidding purposes only. The contract documents and the complete scope of work for the project are illustrated on the combined Architectural, Structural, Plumbing, Heating, Ventilating, Air Conditioning and Electrical, and each Bidder shall thoroughly acquaint himself with all the details of the complete set of drawings and specifications before submitting his bid. All drawings and specifications form a part of the contract documents for each separate contract and shall be considered as bound therewith in the event partial sets of plans and specifications are issued for bidding only. The submission of bids shall be deemed evidence of the review and examination of all drawings, specifications, and addenda issued for this project as no allowances will be made because of unfamiliarity with any portion of the complete set of documents.
- C. It is the intent of these specifications to provide complete installations even though each and every item necessary is not specifically mentioned or shown. In general, the work specified in this section shall consist of, but is not limited to, the following:
 - 1. Electrical demolition.
 - 2. Systems of raceways, conductors, cables, boxes, receptacles, wiring devices, and cover plates.
 - 3. Relays, wiring, devices, contactors, conduit and other required equipment for all systems and details shown on the electrical drawings.
 - 4. Electrical identification.
 - 5. Surge Protective Devices (SPDs)
 - 6. Utility services, utility requirements, including conduit and coordination.
 - 7. Switchgear including switchboards and panelboards.
 - 8. Secondary electrical service and distribution system including wiring.
 - 9. Luminaires, LED modules and drivers.
 - 10. Coordination (including voltage, phase, ampacity, etc.) and final connection to all line voltage systems or equipment provided under other divisions or by owner.
 - 11. Testing of wire and cable installation.
 - 12. Submittals and shop drawings.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Control wiring of HVAC and related equipment as specified in other sections.
- B. Motor starters required on HVAC and related equipment as specified in other divisions and sections.

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1 1.4 REFERENCES
2

- 3 A. On projects where the engineer is the prime consultant and no architect is involved, any
4 references to the architect or to architectural drawings in the Division 26 specifications shall
5 be interpreted as referring to the engineer or to the engineering drawings.
6

7 1.5 CODES, STANDARDS AND THEIR ABBREVIATIONS
8

- 9 A. Perform all Division 26 work in strict accordance with the requirements and recommendations
10 stated in the codes and standards except when requirements are modified by the contract
11 documents.
12

- 13 B. In addition to the requirements outlined in other sections of the specifications the following
14 standards are imposed as applicable to the work in each instance:

- 15 1. NECA standards for installation.
16 2. NFPA No. 70, National Electric Code.
17 3. Local Codes and Ordinances.
18 4. COG Standard Specifications for Public Works Construction.
19 5. Title 25, Health Services, Part 2, Texas Department of Health, Chapter 145, Long Term
20 Care Subchapter Q.
21 6. OSHA Standard 2207 - Construction Industry Standard
22 7. OSHA 29 CFR 1926 - Regulation of Excavation
23 8. Texas Underground Facility Damage Prevention Act (H.B. 2295)
24

- 25 C. Where local codes or practices exceed or conflict with the NEC, it shall be the Contractor's
26 responsibility to perform the work in accordance with the local code prevailing and local
27 interpretations thereof. Any such additional work shall be performed at no additional cost to
28 the Owner.
29

- 30 D. Materials and components shall be UL listed and approved for the purpose intended.
31

- 32 E. The Contractor shall obtain all permits required to commence work and, upon completion of
33 the Work, obtain and deliver to the Owner's Representative a Certificate of Inspection and
34 Approval from the State Board of Fire Underwriters, the City of Galena Park, Texas and other
35 authority having jurisdiction. The Contractor shall pay required permit fees.
36

37 1.6 LIST OF ASSOCIATIONS AND STANDARDS
38

- 39 A. The following abbreviations are applicable for this entire division.

- 40 1. ANSI - American National Standards Institute, 1430 Broadway; New York, NY 10018.
41 2. ASTM - American Society for Testing and Materials, 1916 Race Street; Philadelphia, PA
42 19103.
43 3. IEEE - Institute of Electrical and Electronics Engineers, 345 East 47th Street; New York,
44 NY 10017.
45 4. ICEA - Insulated Cable Engineers Association, P.O. Box P; South Yarmouth, MA 02664.
46 5. NEC - National Electrical Code; NFPA No. 70.
47 6. NECA - National Electrical Contractors Association, Inc., 7315 Wisconsin Ave.;
48 Washington, DC 20014.
49 7. NEMA - National Electrical Manufacturers Association, 155 East 44th Street; New York,
50 NY 10017.
51 8. NESC - National Electrical Safety Code, ANSI 2.
52 9. NFPA - National Fire Protection Association, 60 Batterymarch Street; Boston, MA 02110.
53 10. OSHA - Occupational Safety and Health Administration, US Department of Labor;
54 Washington, DC 20402.
55 11. UL - Underwriters Laboratories, Inc., 333 Pfigsten Road; Northbrook, IL 60062.
56

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- 1 B. Nothing in the Contract Documents shall be construed to permit work not conforming to these
2 codes. When two or more codes or standards are applicable to the same work, then the stricter
3 code or standard shall govern.
4
5 C. The date of the code or standard is that in effect on the date of issue of the contract documents
6 except when a particular publication date is specified.
7
8 D. This Contractor shall comply with all State, Federal, NFPA, local codes and ordinances that
9 may alter any part of the plans or specifications. This Contractor shall bear all costs for
10 correcting any deficiencies due to non-compliance.
11
12 E. Where local codes and ordinances are not in writing or on record but a local precedence has
13 been set, the Owner shall pay for any additional resulting cost.
14

15 1.7 DEFINITIONS
16

- 17 A. Approval: It is understood that approval must be obtained from the Architect in writing before
18 proceeding with the proposed work. Approval by the Architect of any changes, submitted by
19 the Contractor, will be considered as general only to aid the Contractor in expediting his work.
20
21 B. Directed: Terms such as directed, requested, authorized, selected, approved, required, and
22 permitted mean directed by the Architect, requested by the Architect, and similar phrases.
23
24 C. Furnish: The term furnish means to equip with what is needed, supply and deliver to the Project
25 site, ready for unloading, unpacking, assembly, installation, and similar operations.
26
27 D. Install: The term install describes operations at the Project site including setting in position,
28 connecting on adjusting for use, the actual unloading, unpacking, assembly, erection, placing,
29 anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar
30 operations.
31
32 E. Provide: Defined as requiring the furnishing, supplying, to make available, and installation of
33 the item or facility indicated, complete in all respects and ready for operation unless otherwise
34 specifically noted.
35
36 F. Indicated: The term indicated refers to graphic representations, notes, or schedules on the
37 Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements
38 in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used
39 to help the reader locate the reference. There is no limitation on location.
40

41 1.8 ABBREVIATIONS FOR ELECTRICAL DRAWINGS
42

43	A	Amperes
44	ALT	Alternate
45	AFF	Above finish floor
46	AFG	Above finished grade
47	AWG	American wire gauge
48	ATS	Automatic transfer switch
49	CLG	Ceiling
50	CKT	Circuit
51	CCTV	Closed circuit television
52	DFA	Down from above
53	DISC	Disconnect
54	EWC	Electric water cooler
55	EXIST	Existing
56	FAP	Fire alarm plan

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1	FACP	Fire alarm control panel
2	FAGA	Fire alarm graphic annunciator
3	FARA	Fire alarm remote annunciator
4	FPC	Fire protection contractor
5	GRN	Ground
6	GFCI	Ground-fault circuit interrupters
7	GFP	Ground-fault protection
8	HP	Horsepower
9	HPS	High pressure sodium
10	KW	Kilowatts
11	KES	Kitchen equipment supplier
12	MTS	Manual transfer switch
13	MH	Metal Halide
14	MCC	Motor control center
15	NC	Normally closed
16	NO	Normally open
17	NTS	Not to scale
18	NIC	Not in contract
19	PNL	Panel
20	SFD	Smoke/Fire Damper
21	SU	Stub up above finish floor
22	SWBD	Switchboard
23	TV	Television
24	TX	Transformer
25	TYP	Typical

- 26
- 27 1.9 NEMA CLASSIFICATIONS
- 28
- 29 A. For complete definitions and listing see NEMA Standards.
- 30 Type 1 General Purpose, Indoor.
- 31 Type 2 Drip-proof, Non corrosive, Indoor.
- 32 Type 3R Rain proof, Outdoor.
- 33 Type 4 Watertight and dust tight, Non corrosive. Indoor and outdoor.
- 34 Type 4X Watertight and dust tight, Corrosion resistant. Indoor and outdoor.
- 35 Type 12 Dust tight, Drip-tight, Non corrosive, Indoor. See NEC 2008 110.22 FPN.
- 36
- 37 1.10 PROJECT/SITE CONDITIONS
- 38
- 39 A. Before submitting a proposal, each bidder shall examine all plans and specifications relating
- 40 to the work, shall visit the site of the project and become fully informed of the extent and
- 41 character of the work required, including all required utilities.
- 42
- 43 B. No consideration will be granted for any alleged misunderstanding of the materials to be
- 44 furnished or the amount of work to be done, it being fully understood that the tender of a
- 45 proposal carries with it the agreement to all items and conditions referred to herein, or
- 46 indicated on the accompanying plans or required by nature of the site of which may be fairly
- 47 implied as essential to the execution and completion of any and all parts of the work.
- 48
- 49 1.11 SUBMITTALS
- 50
- 51 A. Refer to Section 26 00 90, Electrical Submittal Procedures.
- 52
- 53 1.12 QUALITY ASSURANCE
- 54
- 55 A. Provide complete installations of and verify that all systems, comply with NFPA 70, latest
- 56 edition. The more stringent of the N.E.C. or specifications shall apply to this project.

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- 1 B. All materials furnished under this Contract shall be new, free from defects of any kind, of the
2 quality and design hereinafter specified, and shall conform to the standards of Underwriter's
3 Laboratories Inc., except for equipment which U.L. does not list or provide label service.
4
- 5 C. Submit a bid on the basis of a complete installation including all labor, material, delivery,
6 insurance, permits, inspection fees and tests required even though each and every item
7 necessary is not specifically mentioned or shown.
8
- 9 D. In case of any conflict between the specifications, plans and ordinances, the ordinances shall
10 govern. In case of any conflict between the specifications and plans, the Engineer shall make
11 the final decision. Refer to Division 1 - General Requirements.
12

13 1.13 CONTRACTOR'S RESPONSIBILITY

- 14
- 15 A. Erect barricades, protective fencing, and signs as required to prevent injury to personnel on
16 site.
17
- 18 B. Coordinate all utility services and/or revisions with utility companies for base bid.
19
- 20 C. Make permanent connection to new utilities or existing lines. Determine depth and location,
21 and bid accordingly. Relocate and repair any existing lines cut by general construction work.
22
- 23 D. Plans do not show exact location and elevations of lines. Deviate from plans as required to
24 conform to the general construction, provide proper grading and installation.
25
- 26 E. Maintain all utility services during construction to existing portions of job that remain.
27
- 28 F. Procure and pay for all necessary permits or licenses to carry out the work. Pay all costs in
29 connection with metering.
30
- 31 G. Obtain and pay for all the necessary certificates of approval which must be delivered to the
32 Architect before final acceptance of the work.
33
- 34 H. Periodically remove rubbish, clean or repair all surfaces marred by the work required under
35 this contract.
36
- 37 I. Where job conditions require changes in indicated locations and arrangement, make such
38 changes without extra cost to Owner.
39
- 40 J. Exposed piping and/or other materials will not be permitted in the finished job except where
41 noted on the drawings.
42
- 43 K. Provide required hook-up to line voltage at all electromagnetic door holder/release, fire/smoke
44 dampers, and smoke dampers. Provide required relays and wiring to fire alarm panels and
45 coordinate with other specified work.
46
- 47 L. Accomplish all demolition and remodeling work involving this trade in a manner and
48 completeness to provide the appearance of new construction work.
49
- 50 M. Replace any usable equipment and/or structure damaged during demolition and remodel
51 work.
52

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1 1.14 SUBSTITUTION OF PRODUCTS
2

- 3 A. Substitution of products specified herein will be considered only when a complete list of
4 proposed alternative equipment is submitted to the Engineer in writing, supported by adequate
5 technical and cost data. This includes a complete description of the proposed substitution,
6 drawings, catalog cuts, performance data, test data, or any other data or information
7 necessary for evaluation.
8
9 B. All proposed substitutions and data must be received by the Engineer no less than ten working
10 days prior to the schedule date for opening of bids.
11
12 C. The Engineer will consider all such submittals and the Architect will issue an addendum listing
13 items which the Engineer considers acceptable. Only such items as specified or approved as
14 acceptable will be installed on this project.
15
16 D. Manufacturers' names are listed herein and on the plans to establish a standard of quality and
17 design. Where a manufacturer's name is mentioned, products of other manufacturers will be
18 acceptable, if in the opinion of the Engineer, the substitute material is of equivalent quality or
19 better than that of the material specified.
20
21 E. The Contractor's Bid represents that the bid price is based solely upon the materials and
22 equipment described in the Bid Documents (including addenda, if any) and that he
23 contemplates no substitutions or extras.
24
25 F. Items noted as "No Substitutes" shall be as specified only.
26
27 G. Samples shall be provided by the manufacturer of the proposed substitute unit for evaluation
28 when required at no charge and non-returnable.
29
30 H. Requests for substitution are understood to mean that the Contractor:
31 1. Has personally investigated the proposed substitution and determined that it is equivalent
32 or superior in all respects to that specified.
33 2. Will provide the same guarantee for the substitution that he would for that specified.
34 3. Will, at no cost to the Owner, replace the substitute item with the specified product if the
35 substitute item fails to perform satisfactorily.
36
37 I. After Award of the Contract, substitutions will be considered only under one or more of the
38 following circumstances.
39 1. The substitution is required for compliance with subsequent interpretations of code or
40 insurance requirements.
41 2. The specified product is unavailable through no fault of the Contractor.
42 3. The manufacturer refuses to warranty the specified products as required.
43 4. Subsequent information that the specified product is unable to perform properly or to fit
44 in the designated space.
45 5. In the Engineer's sole judgment, the substitution would be in the Owner's best interest.
46
47 J. Revisions to the electrical system caused by substitutions shall be under the supervision of
48 the Engineer at a standard hourly rate charged by the Engineer and shall be paid by the
49 Contractor originating the changes.
50

51 1.15 PROJECT RECORD DOCUMENTS
52

- 53 A. This Contractor shall keep a set of plans on the job, noting daily all changes made in
54 connection with the final installation including exact dimensioned locations of all new and
55 existing switchgear, devices, fixtures, equipment and new or existing site utilities and lights.
56

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- 1 B. Upon submitting his request for final payment, he shall turn over to the Architect, record
2 document submittals as outlined in Division 1 - General Requirements of the Specifications.
3
4 C. In addition to the above, the Contractor shall accumulate during the job's progress the
5 following data, in duplication. Two (2) each prepared in a three inch (3"), 3-ring binder, neat in
6 appearance of sufficient size and turned over to the Architect for checking and subsequent
7 delivery to the Owner:
8 1. All warranties, guarantees and manufacturer's directions on equipment and material
9 covered by the Contract.
10 2. All shop drawings.
11 3. Set of operating instructions. Operating instructions shall also include recommended
12 maintenance and seasonal changeover procedures.
13 4. Any and all other data and/or plans required during construction.
14 5. Repair parts lists of all major items and equipment including name, address and
15 telephone number of local supplier or agent.
16
17 D. The first page, or pages, shall have the names, addresses, and telephone numbers of the
18 following:
19 1. General Contractor and all sub-contractors.
20 2. Major Equipment Suppliers.
21 3. Submit megger reading log copies in accordance with Section 26 08 11.
22 4. Submit ground tests methods and results in accordance with Section 26 08 11 &
23 26 05 26.
24 5. Submit testing of electrical system results in accordance with Section 26 08 11.
25 6. Submit conductor insulation test results in accordance with Section 26 05 19.
26 7. Submit SPD warranty in accordance with Section 26 43 00.
27

28 1.16 PLANS AND SPECIFICATIONS

- 29
30 A. The intent of the drawings is to establish the types of systems and functions, but not to set
31 forth each item essential to the functioning of the system.
32
33 B. Electrical drawings are generally diagrammatic and show approximate location and extent of
34 work.
35
36 C. Install the work complete including minor details necessary to perform the function indicated.
37 Provide an electrical system (including all hook ups) complete in every respect and ready to
38 operate.
39
40 D. If clarification is needed, consult the Engineer.
41
42 E. Review pertinent drawings and adjust the work to conditions shown. Where discrepancies
43 occur between drawings, specifications, and actual field conditions, immediately notify the
44 Engineer for his interpretation.
45
46 F. The Architect reserves the right to make any reasonable change in the location of any part of
47 this work without additional cost to the Owner.
48
49 G. Contractor, subcontractor, vendors and suppliers are required to waive subrogation against
50 Owner and Engineer.
51

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1 1.17 ELECTRICAL WIRING AND EQUIPMENT FOR MECHANICAL SYSTEMS

2
3 A. Electrical Contractor to Provide

- 4 1. Line Voltage and hook-up to all plumbing equipment (Division 22), HVAC equipment
5 (Division 23), and building automation equipment (Division 25), including required manual
6 safety switches with fuses/heaters of required size.
7 2. All conduit into accessible attic space for thermostats and sensors.
8 3. All lighting contactors, mechanically held with control relay, required coil voltage
9 coordinated with controls contractor.
10 4. Junction Boxes (Standard One or Two Gang) required for controls contractor, and
11 coordination with controls contractor.

12
13 B. Mechanical Contractor to Provide

- 14 1. All motor starters (with heaters as required).
15 2. All thermostats.
16 3. All HVAC Equipment.
17 4. All relays, contactors, and switches required to start/stop Mechanical Equipment other
18 than switches shown on and required by Division 26.

19
20 C. Controls Contractor to Provide

- 21 1. All required relays associated with Controls in specifications.
22 2. All sensors.
23 3. All conduit required above ceiling.
24 4. All control wiring.

25
26 D. The Electrical plans are based on the equipment and devices scheduled shown on the
27 drawings or as called for in the specifications. Should any mechanical equipment or device
28 associated devices be changed or accepted from those which are shown or noted, all electrical
29 and/or mechanical changes shall be made at the expense of the trade or contractor initiating
30 the change with no expense to the Owner, Architect, Engineer or their representatives.

31
32 E. All conduit and boxes for thermostats and/or sensors shall be provided by this contractor. A
33 thermostat or sensor junction box and 1/2" conduit to accessible attic and/or to corridor shall
34 be provided for each room served with HVAC equipment. Coordinate with Division 23 for exact
35 locations and requirements.

36
37 F. Details on Electrical drawings showing HVAC/Mechanical/Control Equipment providing of
38 various relays devices, wiring and other equipment shall be provided by this Contractor as
39 directed and as required per drawing.

40
41 1.18 UTILITIES, LOCATIONS, AND EXISTING CONDITIONS

42
43 A. Location of power company electrical service poles, transformers, telephone service pedestal,
44 cable television service, and any existing underground services, where shown, have been
45 obtained from substantially reliable sources, are shown as a general guide only, without
46 guarantees as to accuracy.

47
48 B. The Contractor will examine the site, verify all requirements, service points, and availability of
49 all services required to complete this project. No consideration will be granted for any alleged
50 misunderstanding of the materials and labor to be provided as necessitated by nature of the
51 site including those items which may be fairly implied as essential to the execution and
52 completion of any and all parts of this project. All proposals shall take these existing conditions
53 into consideration and the lack of specific information on the drawings shall not relieve the
54 Contractor of any responsibility. Verify location and check for existing underground utilities
55 and lines before ditching.

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- 1 C. The Contractor shall be responsible for repair of any cut or damaged lines or utilities he
2 uncovers. There are lines and utilities not shown on any plans.
3

4 1.19 FINAL COMPLETION REQUIREMENTS
5

- 6 A. The following will be required at time of final completion.
7 1. Refer to general conditions.
8 2. Final clean up completed.
9 3. All systems are fully operational, all material and devices installed and tested.
10 4. Ground tests (megger readings) performed, two copies of method used, and results
11 attached.
12 5. Project Record Documents submitted to the Architect.
13 6. Spare material delivered to the Owner and documented.
14 7. Owner instructions completed.
15

16 1.20 MANUFACTURER'S INSTRUCTIONS
17

- 18 A. All equipment and devices shall be installed in accordance with the drawings and
19 specifications, manufacturer's instructions and applicable codes.
20
21 B. Where specifications call for installation of a product to be in accordance with manufacturer's
22 instructions and/or where manufacturer's instructions are required for installation of a product,
23 it shall be the contractor's responsibility to obtain the necessary applicable manufacturer's
24 instructions and install the product in accordance with the manufacturer's instructions. It shall
25 be the Contractor's responsibility to install all equipment, materials, and devices shown on the
26 plans and as called out in these specifications even if manufacturer's instructions are
27 absolutely unattainable.
28

29 1.21 INSTALLATION
30

- 31 A. Cooperation with trades of adjacent, related or affected materials or operations, and or trades
32 performing continuations of this work under subsequent contracts is considered a part of this
33 work in order to effect timely and accurate placing of work and to bring together, in proper and
34 correct sequence, the work of such trades, including under the general contractor Division 1,
35 and Division 23.
36
37 B. The Electrical Contractor shall coordinate installation of the electrical system with the General
38 Contractor, Mechanical, Plumbing, and Communications Contractors to insure a complete
39 working system for the Owner.
40
41 C. Where required, all conduit and boxes for all systems, except mechanical controls specified
42 otherwise, shall be provided by the Electrical Contractor. Any and all allowances shall be
43 included.
44
45 D. All wiring shall be enclosed in conduit or raceway in all exposed areas such as gymnasium,
46 shops, stages, or field houses.
47
48 E. Work must be performed by workmen skilled in their trade. The installation must be complete
49 whether the work is concealed or exposed.
50
51 F. The Contractor shall construct foundations for floor mounted equipment where indicated on
52 the Drawings. Foundations generally shall be built up from structural floor slabs and shall be
53 made of 3000 psi concrete four (4) inches thick unless otherwise indicated or specified. Top
54 edges shall be beveled. All exposed surfaces shall be finished with cement mortar troweled
55 smooth. Reinforcing shall be 6 x 6-10/10 welded wire mesh.
56

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- 1 G. Equipment shall be secured to foundations by this Contractor with anchor bolts embedded in
2 the concrete of ample size and proper arrangements to suit equipment furnished.
3
- 4 H. Conceal electrical work in walls, floors, chases, under floors, underground and above ceilings.
5 Branch circuits shall not be installed in or under the slab, and will not be accepted unless
6 shown or required on the drawings.
7
- 8 I. Coordinate the actual locations of electrical outlets and equipment with building features and
9 mechanical equipment as indicated on architectural, structural and mechanical drawings.
10 Review with the Architect any proposed changes in outlet or equipment location. Relocation
11 of outlets before installation, of up to 3 feet from the position indicated, may be directed without
12 additional cost. Remove and relocate outlets placed in an unsuitable location when so
13 requested by the Architect.
14

15 1.22 TEMPORARY SERVICE AND LIGHTING

- 16 A. Electrical service to all portions of existing buildings at the construction site not involved with
17 the project shall remain in operation throughout construction. Provide all required temporary
18 electrical service in the base bid to all required areas so as to satisfy OSHA requirements.
19
- 20 B. All metering and temporary electrical service charges and/or costs of utilities shall be paid by
21 The Contractor/Managing Construction Contractor.
22

23 1.23 ADDITIONAL MATERIALS

- 24 A. Additional materials to be a dollar cost in the base bid. At the end of the project the contractor
25 shall generate a dollar amount credited back to the owner for any unused items. All attic stock
26 shall be provided to the owner at substantial completion. The base bid shall include all
27 additional materials and attic stock.
28 1. All costs to provide 1 additional electrical circuits, all required circuit breakers, wiring,
29 conduit, labor and devices as specified and directed by Architect. Each circuit to be priced
30 with a rating of 20 amps and at a distance of 100 feet to furthestmost device. Each circuit
31 to include (8) duplex receptacles.
32
- 33 B. Attic Stock - Include the following materials in the base bid:
34 1. None
35
- 36 C. See specification section 26 50 00 - Lighting and 26 09 23 - Lighting Control Devices for other
37 additional materials and attic stock to be provided by this contractor.
38
39
40

41 PART 2 PRODUCTS

- 42 A. Not Used
43
44
45

46 PART 3 EXECUTION

47 3.1 INSTALLATION

- 48 A. All electrical connections shall be made per NEC 110.14. Additionally, where torque values
49 are listed in manufacturer instructions, a calibrated torque tool shall be used to achieve
50 indicated torque values.
51
52
53

54
55 END OF SECTION

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SECTION 26 00 30

WARRANTY PERIOD

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedures during the warranty period.

1.2 RELATED SECTIONS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Division 26, Section 26 00 00, apply to this Section.
1. Section 26 00 00 - Electrical

1.3 WARRANTY

- A. This Contractor shall warranty all work against defective materials and workmanship for a period of one year from and after date of acceptance of the installation by the owner.
- B. Neither the final payment nor any provisions in Contract Documents shall relieve this Contractor, or the Contractor, of the responsibility for faulty materials or workmanship.
- C. The contractor shall remedy any defects due thereto, and pay for any damage to other work resulting there from, which shall appear.
- D. This Warranty shall not be construed to include the normal maintenance of the various components of the system covered by these specifications.

1.4 MAINTENANCE SERVICE

A. Provide normal maintenance services recommended by the manufacturer at no additional cost to the Owner during the warranty period.

PART 2 PRODUCTS

A. Not Used.

PART 3 EXECUTION

A. Not Used.

END OF SECTION

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SECTION 26 00 90

ELECTRICAL SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. This section contains requirements applicable to Division 26 submittals.

1.2 SECTION INCLUDES

A. This section includes, but is not limited to:

- 1. Electrical submittal procedures
- 2. List of required Division 26 submittals to the engineer

B. This section applies only to the Division 26 specifications. Submittals required by other specification divisions are not included here, even though the same subcontractor may be providing work under other divisions.

1.3 SUBMITTALS

A. The materials, workmanship, design, and arrangement of all work installed under this contract shall be subject to the review of the architect, engineer and owner.

B. Manufacturers: Manufacturers submitted shall be as per the acceptable manufacturers listed in each specification section or referenced schedule. For additional manufacturers requiring approval, reference the Substitution of Products article in section 26 00 00.

C. Required submittals: Refer to the Submittals article of each individual Division 26 specification section for the required items to be submitted.

D. Color selection: Some products require that a color selection be coordinated with the architect. Information regarding such products shall be submitted to the architect.

E. Contractor's coordination submittals: The contractor may require his subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the project, but such data shall remain between the contractor and his subcontractors and will not be reviewed by the engineer.

F. Electronic Submittals: Provide submittals in pdf format. Paper submittals will be rejected.

G. Coordination correspondence: The contractor may desire to verify the acceptability of a particular item prior to assembling the submittal package. The contractor may send material directly to the engineer for comments and feedback. This communication, whether by mail, fax, or e-mail, will be treated as normal coordination correspondence and will not be tracked or documented as a formal submittal. The engineer may or may not respond to such correspondence. If the engineer agrees, in writing, to the use of a particular item, then that same material shall be included in the submittal package along with a copy of the correspondence.

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1 H. Unapproved products: If materials or equipment are installed before being reviewed and
2 approved by the engineer, the contractor shall be liable for the removal and replacement of
3 such unapproved materials and equipment, at no additional expense to the owner.
4 Additionally, if the removal and replacement of unapproved materials or equipment
5 necessitates the removal and replacement of other related materials or equipment, then the
6 contractor shall be liable for the removal and replacement of the related materials and
7 equipment at no additional expense to the owner.

8
9 1.4 PRODUCT DATA

10 A. Where the content of manufacturer submittal literature includes data not pertinent to the
11 submittal, clearly indicate which portions of the contents are being submitted for review.
12 Catalogs, pamphlets, or other documents submitted to describe items on which review is being
13 requested shall be specific and identifications in catalog, pamphlets, etc., of items submitted
14 shall be clearly made in a contrasting color or highlighting. Data of a general nature shall not
15 be acceptable.

16
17
18 1.5 SHOP DRAWINGS

19 A. Scale and measurements: Make shop drawings accurately to a scale sufficiently large to show
20 all pertinent aspects of the item.
21
22 B. Types of prints required: Submit in pdf format.

23
24
25 1.6 SEQUENCING

26 A. Submit product information within 30 calendar days after the contractor has received the
27 owner's notice to proceed.
28
29 B. After the engineer has reviewed the submittals, make necessary revisions as directed by the
30 engineer and resubmit.
31
32 C. After the submittal has been reviewed and approved by the engineer, proceed to purchase
33 materials and perform the work.

34
35
36 1.7 SCHEDULING

37 A. Failure to submit items that meet the requirements of the contract documents in ample time
38 for review shall not entitle the contractor to an extension of contract time, and no claim for
39 extension by reason of such default shall be allowed. The contractor may be held liable for
40 delays so occasioned.
41
42

43
44 PART 2 PRODUCTS

45 A. Not applicable.

46
47
48
49 PART 3 EXECUTION

50
51 3.1 GENERAL

52 A. Submit product data, shop drawings, samples, quality assurance submittals, quality control
53 submittals, and other items in accordance with the requirements of this section, applicable
54 sections in Division 1, and additional requirements of each individual Division 26 specification
55 section.
56

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1 3.2 SUBMITTAL ORGANIZATION
2

- 3 A. Provide a submittal cover page that lists at least the following:
4 1. Project name
5 2. Date
6 3. Name and address of architect
7 4. Name and address of engineer
8 5. Name, address and telephone number of electrical distributor
9 6. Name, address and telephone number of prime contractor
10 7. Name, address and telephone number of electrical contractor
11
12 B. Provide an index page listing all items submitted.
13
14 C. The contractor shall call to the attention of the engineer by letter, included in the submittal after
15 the index page, any instance in which the submittals are known to differ from the requirements
16 of the contract documents.
17
18 D. Organize all required items by specification section. All material for each specification section
19 shall be in one single pdf file. Material for multiple specification sections may be combined into
20 one file.
21
22 E. The material for each specification section shall be organized as follows:
23 1. The first page shall indicate the specification number and title and the name, address and
24 telephone number of the vendor or vendor's representative, if applicable.
25 2. Refer to the individual Division 26 specification sections for any required organization of
26 the submittal material within each submittal section.
27
28 F. Send pdf submittals to the engineer's office via email or other electronic means.
29
30 G. Submittals not organized as described here may be rejected, without being reviewed, as not
31 complying with the provisions of the contract.
32

33 3.3 CLOSEOUT SUBMITTALS
34

- 35 A. Provide close-out submittals in accordance with the requirements of Division 1.
36

37 3.4 SCHEDULES
38

- 39 A. Division 26 Submittal Schedule: The Division 26 submittal shall include the following items for
40 each Division 26 specification section that is in the contract documents. Coordinate this list
41 with the submittal requirements listed in each specification section. If an item has been omitted
42 from either list but is included in the other, then provide that item in the submittal. In case of
43 conflicting or unclear requirements, contact the engineer.

END OF SECTION

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SECTION 26 05 11

ELECTRICAL DEMOLITION

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PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Electrical demolition.
- B. Off-site removal of materials not reused.

1.2 RELATED SECTIONS

- A. Section 26 00 00 - Electrical
- B. Section 26 05 53 - Identification for Electrical Systems

PART 2 PRODUCTS

- A. Not used.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing field measurements, circuiting arrangements, wiring and equipment served in areas as shown on the Drawings. Adjust all circuiting, wiring and materials to be provided as required by job conditions.
- B. Verify abandoned wiring and equipment serving only abandoned facilities.
- C. Drawings are based on casual field observation and existing record documents. Report discrepancies to the Engineer before disturbing existing installation.
- D. The Contractor accepts the existing conditions when beginning demolition.

3.2 PREPARATION

- A. Disconnect electrical systems in walls, floors and ceilings as shown or required.
- B. Coordinate utility service outage with the respective utility company and the Owner.
- C. Provide temporary wiring and connections to maintain required existing systems in service during construction.
- D. When work must be performed on energized equipment or circuits, use personnel experienced in such operations. Verify phasing on existing equipment and coordinate new phasing before energizing revised service.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Demolish and extend existing electrical work under provision of Division 1 and this section.

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- 1 B. Remove, relocate and extend existing installations to accommodate new construction as
2 required.
- 3
- 4 C. Remove abandoned wiring to the source of the supply.
- 5
- 6 D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling
7 finishes. Cut conduit flush with walls, floors and patch surfaces.
- 8
- 9 E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit
10 servicing them is abandoned and removed. Provide blank cover for abandoned outlets which
11 are not removed in masonry construction.
- 12
- 13 F. Disconnect and remove electrical devices and equipment serving equipment that has been
14 removed.
- 15
- 16 G. Disconnect and remove abandoned lighting fixtures. Remove brackets, stems, hangers and
17 other accessories.
- 18
- 19 H. Repair adjacent construction and finishes damaged during demolition and extension work.
- 20
- 21 I. Maintain access to existing electrical installations which remain active. Modify installation or
22 provide access panel as appropriate.
- 23
- 24 J. Extend existing installations using materials and methods compatible with existing electrical
25 installations or as specified.
- 26
- 27 K. Confirm with Owner or Architect regarding the handling and disposal/reuse of removed
28 material, equipment, devices, lights, etc.
- 29

30 3.4 REPAIR/RESTORATION

- 31
- 32 A. Clean and repair existing materials and equipment, in areas of revision, which remain or which
33 are to be reused.
- 34
- 35 B. Panelboards:
 - 36 1. Clean exposed surfaces and check tightness of electrical connections.
 - 37 2. Replace damaged circuit breakers and provide closure plates for vacant positions.
 - 38 3. Provide typed circuit directory showing revised circuiting arrangement as specified, on all
39 existing switchgear.
 - 40 4. Provide new identification nameplates per Section 26 05 53.
- 41

42 3.5 RE-INSTALLATION

- 43
- 44 A. Install all relocated materials and equipment under the provisions of Divisions 1 and 26.
- 45

46 END OF SECTION

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SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section includes conductors for power circuits, including terminations and connectors.

1.2 RELATED SECTIONS

- A. Section 26 00 00 - Electrical
- B. Section 26 00 90 - Electrical Submittal Procedures
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems
- D. Section 26 08 11 - Testing of Electrical System

1.3 REFERENCES

- A. ICEA S-61-402 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- B. UL 44 – Thermoset-Insulated Wires and Cables
- C. UL 83 - Thermoplastic-Insulated Wires
- D. National Electric Code
- E. UL 493 - Thermoplastic Insulated Underground Feeder and Branch Circuit Cables

1.4 SUBMITTALS

- A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1, and Division 26, Section 26 00 90 - Electrical Submittal Procedures.
- B. Product Data: Submit product data for the following:
 - 1. Conductors for power circuits
 - 2. Conductor terminations
 - 3. Connectors
- C. Closeout Submittals: Closeout submittals shall include the following.
 - 1. Submit letter certifying acceptable testing of all branch circuits.
 - 2. Submit insulation test results for all new feeders installed in this project.

1.5 QUALITY ASSURANCE

- A. General work practices for electrical construction shall be in accordance with NECA 1, Standard Practices for Good Workmanship in Electrical Construction.
- B. Regulatory Requirements: All products provided under this section shall be UL listed for the intended use.

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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Protection: Material shall be stored in a clean and dry location until installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Conductors shall be manufactured in the United States. Acceptable manufacturers are:
 - 1. Alan Wire
 - 2. Cerro Wire
 - 3. Encore Wire
 - 4. General Cable
 - 5. Southwire
- B. All other manufacturers shall require pre-approval in accordance with specification section 26 00 00.

2.2 MATERIALS

- A. All feeders to be soft-drawn annealed copper.
- B. All branch circuit conductors shall be soft-drawn annealed copper.
- C. Where aluminum is allowed, aluminum shall be AA-8xxx rated and compact stranding is preferred.

2.3 MANUFACTURED UNITS

- A. Manufactured conductors for power circuits:
 - 1. All conductors for power circuits shall be rated for at least 600 volts.
 - 2. The insulation for power conductors shall be type THWN-2 or THHN/THWN.
 - 3. Conductors for power circuits shall be #12 AWG or larger.
 - 4. Conductors for power circuits that are #12 AWG or #10 AWG shall be solid. Conductors for power circuits that are #8 AWG and larger shall be stranded.
 - 5. Conductors sized #6 AWG and smaller shall have factory colored insulation.
- B. MC Cable: MC cable is acceptable for use in walls and concealed spaces in lengths not to exceed twelve feet.
- C. Manufactured conductor terminations and connectors:
 - 1. All accessory materials such as connectors, splice and tap fittings, and terminations shall be of a type designed or intended and suitable for the use. They shall be compatible with the conductor material. Installation, compression, and torque settings shall be per manufacturer's recommendations.
 - 2. Conductors shall be connected and terminated using suitable listed clamps, listed pressure connectors, listed compression terminals or listed lugs and hardware of the proper size for the application.
 - 3. Only connection devices that require the complete removal of the conductor jacket or insulation and result in a connection to the complete conductor surface area are suitable for use. Insulation piercing type connectors shall not be used.
 - 4. Splices and taps shall have a mechanical strength and insulation rating at least as that of the conductors.

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- 5. Compression systems shall include crimped die index and company logo for purposes of inspection. Aluminum shall not be used for connection purposes.

PART 3 EXECUTION

3.1 SITE VERIFICATION OF CONDITIONS

- A. Do not install the conductors until raceway system is complete.
- B. Before installing the conductors for any power circuit or feeder, verify that the conductor ampacity is at least as large as the rating of the overcurrent device protecting it. In the event that the conductors would not be adequately protected, notify the engineer before installation.

3.2 INSTALLATION

- A. Wire Sizing: Provide conductors sized as indicated on drawings unless modified as described below. Where conductor sizes have been omitted from drawings, base bid shall include conductors with ampacity as least as large as the overcurrent protection device protecting the conductors, or at least as large as the amp rating of the load being served, whichever is greater. In such cases, notify the engineer before installation for size verification. When pulling 120v branch circuits, #12 wire shall not be run more than 90', #10 wire shall not be run more than 120', #8 wire shall not be run more than 150', etc.
- B. Neutral Conductors: Provide a separate neutral conductor for each circuit. Multiple circuits shall not share a common neutral. Neutral conductors shall be sized as large as the phase conductors. Neutral conductors shall not be of a reduced size.
- C. Equipment grounding conductors: Provide equipment grounding conductors in accordance with specification section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Number of Conductors per Conduit: When #12 AWG conductors are used on 20-amp circuits, install no more than six conductors in a single conduit run. When #10 AWG conductors are used on 20-amp circuits, install no more than nine conductors in a single conduit run. Otherwise, there shall be no more than three conductors in each conduit run. The equipment grounding conductor shall not be counted for the preceding statements.
- E. Installation in Raceways:
 - 1. Install all conductors for power circuits in raceways.
 - 2. All conductors to be installed in a raceway shall be pulled together. Use an approved wire pulling compound when pulling large conductors.
 - 3. Do not bend any conductor either permanently or temporarily during installation to radii less than four times the outer diameter of conductors.
 - 4. Do not exceed manufacturer's recommended values for maximum pulling tension.
 - 5. When installing conductors in existing conduit, the interior of the existing conduit shall be cleaned prior to the installation of the new conductors to insure that there is nothing that will damage the insulation.
 - 6. The pulling device shall be of a type that will not damage the raceway.

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F. Terminations:

1. Use pressure type lugs or connectors for terminations or splices of all stranded conductors. Use ring tongue type terminators on all control wiring. More than one conductor shall not be installed in any termination unless the termination is marked as suitable for more than one conductor. With the written approval of the engineer's office, an exception to this may be allowed for the installation of the surge protective devices required in specification section 26 43 00 Surge Protective Devices.
2. Conductors shall not be supported solely by their terminations.
3. Terminations shall be made such that the stripped length of the conductor is no longer than required for the terminal, lug, or connector.
4. Conductive antioxidant shall be applied on all outdoor connections and connections in damp or wet locations, regardless of conductor material.

G. Splices:

1. Conductor splices shall be kept to a minimum.
2. Where splices are necessary, they shall be in a box or enclosure. Splices within a conduit run are not acceptable.

H. Color Coding:

1. Provide factory colored insulated conductors for #6 AWG and smaller.
2. Color code larger insulated conductors with an approved field-applied tape 2" wide on each end of conductors.
3. If existing wiring in renovation or addition work has a consistent color coding, then match the existing and note in record documents. Otherwise, colors shall be as follows:

Line	208/120V	240/120V	480/277V
A	Black	Black	Brown
B	Red	Orange	Orange
C	Blue	Blue	Yellow
Neutral	White	White	Gray
Ground	Green	Green	Green
Isolated Ground	Green +Yellow	Green + Yellow	Green + Yellow

4. Switch leg shall be the same color as the un-switched phase wiring. Travelers, and special systems as selected by the Contractor. Note in record drawings.

I. Identification: All conductors in a panelboard shall be identified by means of tags or tape.

3.3 SITE TESTS

- A. Perform in accordance with manufacturer's printed testing procedures, applicable industry standards, ANSI standards, IEEE standards, and NEMA standards. Provide testing equipment in good working order and which complies with the applicable industry standards and manufacturer's requirements. Submit a list of testing equipment used and date of last calibration.
- B. Insulation Test: The insulation of each feeder run and each branch circuit shall be tested. The test shall be performed after the conductors have been pulled into the conduit and after terminations have been added, but before final connections are made.
- C. Test the following:
 1. Phase to phase resistance
 2. Phase to neutral resistance
 3. Phase to ground resistance
 4. Neutral to ground resistance

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- 1 D. Branch Circuits: The insulation of branch circuits may be tested with a standard ohm meter.
2 Readings must indicate an open circuit to be acceptable. Submit letter documenting that all
3 circuits have been tested and are acceptable.
4
5 E. Feeders:
6 1. Perform megger tests on all new feeder runs.
7 2. Tests shall be performed in accordance with the Publication "Instruction Manual For
8 Megger Insulation Testers" by the Biddle Company.
9 3. Written documentation of the test results shall be submitted in accordance with
10 specification section 26 08 11 - Testing of Electrical System.
11
12

END OF SECTION

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SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 26 00 00, apply to this Section.

1.2 SECTION INCLUDES

- A. This Section includes solid grounding of electrical systems and equipment. It includes basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other sections of these Specifications.

1.3 RELATED SECTIONS

- A. Section 26 00 00 - Electrical
- B. Section 26 08 11 - Testing of Electrical System

1.4 REFERENCES

- A. National Electrical Code
- B. ANSI/IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
- C. ANSI/UL 467 - Safety Standard for Grounding and Bonding Equipment.

1.5 SUBMITTALS

- A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1, and Division 26, Section 26 00 90 requirements.
- B. Submit grounding materials and devices to be used.
- C. Submit test results of megger reading to Engineer after installation of grounds with records for Owner.
- D. Revisions to grounding will be to satisfaction of the Engineer at no cost by the Contractor.

PART 2 PRODUCTS

2.1 GROUND RODS

- A. Copper cladding permanently bonded to a high-strength steel core, molten welded to core.
- B. 3/4 inch by 10 feet (19mm by 30m) Straight, Conform to UL 467.

2.2 CONNECTIONS

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- 1 2.2.1 GENERAL CONNECTION REQUIREMENTS
2
3 A. Listed and labeled as grounding connectors for the materials used.
4
5 2.2.2 OUTDOOR & BELOW GRADE GROUNDING CONNECTIONS
6
7 A. Welded.
8
9 B. Provide starting material in kit form.
10
11 C. Aluminum, copper and iron oxide.
12
13 D. No phosphorous or any other caustic, toxic or explosive substance may be used.
14
15 E. Manufacturer/Model
16 1. Erico Products "Cadweld Exothermic"
17 2. Thermoweld
18
19 2.2.3 OUTDOOR & ABOVE GRADE GROUNDING CONNECTIONS
20
21 A. Bonds and clamps.
22
23 B. Non-ferrous material which will not cause electrolytic action between the conductor and
24 connector.
25
26 C. Provide exothermal welding where clamping is not accessible.
27
28 2.2.4 INDOOR GROUNDING & POWER CONNECTIONS
29
30 A. Provide clamps as listed for outdoor applications.
31
32 B. Use low smoke/low emission welding where not accessible.
33
34 C. Manufacturer/Model: Erico Products "Cadweld Exolon".
35
36 D. Service Entrance Grounding Connections: U-bolt with pressure plate.
37
38 2.3 WIRING
39
40 A. Copper 600 volt insulated conductors with a green-colored insulation for bonding.
41
42 B. Grounding conductors to be in accordance with NEC Table 250-95.
43
44 C. Bonding jumpers to be minimum cross-sectional area greater than or equal to that of the
45 equivalent grounding conductor as determined from NEC Table 250-95.
46
47 D. Use to ground electrode and equipment grounding conductors.
48
49 2.4 MISCELLANEOUS CONDUCTORS
50
51 A. Ground Bus: Bare annealed copper bars of rectangular cross section. 98% IAGS conductivity,
52 not less than 25% of feeders cross section area.
53
54 B. Braided Bonding Jumpers: Copper tape, braided No. 3/0 AWG bare copper wire, terminated
55 with copper ferrules.
56

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- 1 C. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inch (1mm) thick and 2 inches
2 (50mm) wide, except as indicated.
3
4 D. Manufacturers: Products of the following manufacturers which meet the requirements of these
5 specifications are acceptable.
6 1. Anixter Brothers, Inc.
7 2. Blackhawk Industries
8 3. Burndy
9 4. Copperweld Corporation
10 5. Erico Products, Inc.
11 6. Ideal Industries, Inc.
12 7. IIsco
13 8. ITT Blackburn
14 9. Joslyn
15 10. OZ/Gedney Co.
16 11. Raco, Inc.
17 12. Thomas & Betts Corp
18
19

20 PART 3 EXECUTION

21
22 3.1 APPLICATION

23
24 3.1.1 EQUIPMENT GROUNDING CONDUCTOR APPLICATION

- 25
26 A. Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors,
27 except where larger sizes or more conductors are indicated.
28
29 B. All power circuits shall be provided with a separate copper insulated equipment grounding
30 conductor (EGC) run in the raceway with the power conductors. The conduit is not to be used
31 as the sole means of grounding. The insulation of the EGC shall be green.
32
33 C. Bonding to the EGC shall be provided at each end of metallic conduit runs and at all boxes
34 and enclosures.
35
36 D. All branch circuits and feeders that require an isolated ground (IG) equipment grounding
37 conductor shall be provided with a separate copper insulated IG equipment grounding
38 conductor run in the raceway with the power conductors. The IG equipment grounding
39 conductor shall be provided in addition to the normal EGC. The insulation of the IG equipment
40 grounding conductor shall be green with a yellow stripe.
41
42 E. Conduits and boxes of IG circuits shall be bonded to the normal EGC as stated above. At
43 outlet locations, the IG equipment grounding conductor shall connect only to the isolated
44 ground terminal of an isolated ground outlet. There shall be no connection, either directly or
45 indirectly, between the normal EGC and the IG equipment grounding conductor at any point
46 other than at the source of a separately derived system (transformer) or at the service
47 entrance.
48
49 F. The following circuits shall be provided with an IG equipment grounding conductor:
50 1. Feeders providing power to panels equipped with an IG buss.
51 2. All branch circuits originating at a panel with an IG buss.
52

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- 1 3.1.2 COMMUNICATIONS
2
3 A. For communication systems, provide a #2 AWG minimum green insulated copper conductor
4 in raceway from the grounding electrode system to each terminal cabinet or central equipment
5 location and to the ground bar in all IDF / MDF rooms.
6
- 7 3.1.3 METAL POLES SUPPORTING OUTDOOR LIGHTING FIXTURES
8
9 A. Ground pole to a grounding electrode as indicated in addition to separate equipment
10 grounding conductor run with supply branch circuit.
11
- 12 3.2 INSTALLATION
13
- 14 3.2.1 GENERAL
15
16 A. Ground electrical systems and equipment in accordance with NEC requirements except where
17 the Drawings or Specifications exceed NEC requirements.
18
- 19 3.2.2 GROUND RODS
20
21 A. Locate a minimum of one-rod length from each other and at least the same distance from any
22 other grounding electrode. Interconnect ground rods with bare conductors buried at least 24
23 inches (600 mm) below grade. Connect bare-cable ground conductors to ground rods by
24 means of exothermic welds except as otherwise indicated. Make these connections without
25 damaging the copper coating or exposing the steel. Use 3/4 inch by 10-ft. (19mm by 30 m)
26 ground rods except as otherwise indicated. Drive rods until tops are 6 inches (150mm) below
27 finished floor or final grade except as otherwise indicated. Provide "Powerfill" "Gem" or equal
28 conducting material in quantity recommended by manufacturer at all ground rods.
29
- 30 3.2.3 METALLIC WATER SERVICE PIPE
31
32 A. Provide insulated copper ground conductors, sized as indicated, in conduit from the building
33 main service equipment, or the ground bus, to main metallic water service entrances to the
34 building. Connect ground conductors to the main metallic water service pipes by means of
35 ground clamps. Where a dielectric main water fitting is installed, connect the ground conductor
36 to the street side of the fittings. Do not install a grounding jumper around dielectric fittings.
37 Bond the ground conductor conduit to the conductor at each end.
38
- 39 B. Route bond interior metal piping systems and metal air ducts to equipment ground conductors
40 of pumps, fans, electric heaters, and air cleaners serving individual systems.
41
- 42 3.2.4 GROUND
43
44 A. Fabricate with 20 feet (60m) of conductor laid lengthwise in excavation for foundation or
45 footings. Install so conductor is within 2 inches (50mm) of the bottom of the concrete. Where
46 base of foundation is less than 20 feet (60m) in length, coil excess conductor at base of
47 foundation. Bond conductor to reinforcing steel at four locations, minimum. Extend conductor
48 below grade and connect to building grounding electrode.
49
- 50 3.3 CONNECTIONS
51
- 52 3.3.1 GENERAL
53
54 A. Make connections in such a manner as to minimize possibility of galvanic action or electrolysis.
55 Select connectors, connection hardware, conductors, and connection methods so metals in
56 direct contact will be galvanically compatible.

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- 1 B. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact
2 points closer in order of galvanic series. Make connections with clean bare metal at points of
3 contact.
4
5 C. Aluminum to steel connections shall be with stainless steel separators and mechanical
6 clamps. Aluminum to galvanized steel connections will be with tin-plated copper jumpers and
7 mechanical clamps.
8
9 D. Coat and seal connections involving dissimilar metals with inert material such as red lead paint
10 to prevent future penetration of moisture to contact surfaces.

11
12 3.3.2 EXOTHERMIC WELDED CONNECTIONS
13

- 14 A. Use for connections to structural steel and for underground connections except those at test
15 wells. Install at connections to ground rods and plate electrodes. Comply with manufacturer's
16 written recommendations. Welds that are puffed up or that show convex surfaces indicating
17 improper cleaning are not acceptable.
18
19 B. Terminate insulated equipment grounding conductors for feeders and branch circuits with
20 pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without
21 mechanical and electrical connection to the housing, terminate each conduit with a grounding
22 bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in
23 the housing. Bond electrically noncontinuous conduits at both entrances and exits with
24 grounding bushing and bare grounding conductors.
25
26 C. Tighten grounding and bonding connectors and terminals, including screws and bolts, in
27 accordance with manufacturer's published torque tightening values for connectors and bolts.
28 Where manufacturer's torquing requirements are not indicated, tighten connections to comply
29 with torque tightening valves specified in UL 486A and UL 486B.
30

31 3.3.3 COMPRESSION-TYPE CONNECTIONS
32

- 33 A. Use hydraulic compression tools to provide the correct circumferential pressure for
34 compression connectors. Use tools and dies recommended by the manufacturer of the
35 connectors. Provide embossing die code or other standard method to make a visible indication
36 that a connector has been adequately compressed on the ground conductor.
37

38 3.3.4 MOISTURE PROTECTION
39

- 40 A. Where insulated ground conductors are connected to ground rods or ground buses, insulate
41 the entire area of the connection and seal against moisture penetration of the insulation and
42 cable.
43

44 3.4 TESTS
45

- 46 A. Subject the completed grounding system to megger test at each location where a maximum
47 ground resistance level is specified, at service disconnect enclosure ground terminal, and at
48 ground test wells. Measure ground resistance without the soil being moistened by any means
49 other than natural precipitation or natural drainage or seepage and without chemical treatment
50 or other artificial means of reducing natural ground resistance. Perform tests by the 2-point
51 method in accordance with Section 9.03 of IEEE 81, "Guide for Measuring Earth Resistivity,
52 Ground Impedance and Earth Surface Potentials of a Grounding System". Submit test results
53 in accordance with Section 26 08 11 - Testing of Electrical System.
54
55 B. Ground/resistance maximum values shall be as follows:
56 1. Equipment rated 500 kVA and less: 10 Ohms

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- 1 2. Equipment rated 500 kVA to 1000 kVA: 5 Ohms
- 2 3. Equipment Grounds: 25 Ohms

3

4 3.5 CLEANING AND ADJUSTING

5

- 6 A. Restore surface features at areas disturbed by excavation and reestablish original grades
- 7 except as otherwise indicated. Where sod has been removed, replace it as soon as possible
- 8 after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying
- 9 and other work to their original condition. Include necessary topsoiling, fertilizing, liming,
- 10 seeding, sodding, sprigging, or mulching. Perform such work in accordance with Division 2
- 11 Section. Maintain disturbed surfaces, restore vegetation and restore disturbed paving as
- 12 indicated.

13

14

END OF SECTION

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SECTION 26 05 33.11

RACEWAYS AND CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 26 00 00, apply to this Section.

1.2 SECTION INCLUDES

- A. Electrical raceway and conduit systems.

1.3 RELATED SECTIONS

- A. Section 26 00 00 - Electrical
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems

1.4 REFERENCES

- A. ANSI/ANSI C80.1 - Zinc-Coated Rigid Steel Conduit
- B. ANSI/ANSI C80.4 - Zinc Coated Electrical Metallic Tubing
- C. ANSI/ANSI C80.4 - Fittings for Rigid Metal Conduit and Electrical Metallic Tubing
- D. ANSI/UL 1 - Flexible Metal Conduit
- E. ANSI/UL 5 - Surface Metal Raceways and Fittings
- F. ANSI/UL 651 - Rigid Nonmetallic Conduit
- G. ANSI/UL 797 - Electrical Metallic Tubing
- H. ANSI/UL 870 - Safety Standard for Wireways, Auxiliary Gutters and Associated Fittings
- I. ETL PVC-001 - PVC-Coated Rigid Steel Conduit
- J. NEMA TC2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80) and Fittings
- K. NEMA TC3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing
- L. UL 6 - Rigid Metal Electrical Conduit
- M. UL 360 - Liquid tight Flexible Steel Conduit
- N. UL 467 - Electrical Grounding and Bonding Equipment

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1 1.5 SUBMITTALS
2

3 A. Submittals required in this section shall conform to and be submitted in accordance with the
4 General Conditions, Division 1, and Division 26, Section 26 00 90 requirements. Included in
5 this section are all raceways and conduit, fittings, wireways, supports for conduit on roof, and
6 labeling used. Provide samples upon specific request. U.L. labels affixed to each item of
7 material.
8

9 1.6 DESCRIPTION OF WORK
10

11 A. The use of the various raceway systems is restricted to the types and other restrictions of the
12 NEC and the local codes. Use of all such systems shall be verified with the local code authority
13 before use. In the case of questionable or denied use, the contractor shall be required to use
14 a raceway system permitted by the local code at no additional cost.
15

16 B. Where conduits pass through beams, outside walls, fire rated walls, or structural members,
17 galvanized steel pipe sleeves shall be provided. The size of these sleeves shall be such as to
18 permit readily the subsequent insertion of conduit of the proper size with adequate clearance
19 for movement due to expansion and contraction. Where conduits pass through outside walls,
20 the inside diameter of the galvanized iron pipe sleeves shall be at least 1/2" greater than the
21 outside diameter of the service pipe. After the conduits are installed, fill the annular space
22 between the conduit and its sleeve with a mastic or caulk. Use packing as required to
23 accomplish this. At fire rated wall penetrations, use fire barrier.
24

25 C. All penetrations of fire walls, barriers etc. shall be protected according to all applicable codes.
26 1 string with identifying tag on each end.
27

28 D. Grounding: The installation shall comply with all NEC grounding requirements. See
29 specification section 26 05 26 Grounding and Bonding for Electrical Systems for additional
30 grounding requirements.
31

32 E. Exposed surface raceways are specifically not permitted, in new construction. Where a
33 raceway is required, in existing construction, it shall be solid, without knockouts, with hinged
34 cover, placed so that cover is gravity closed.
35

36 F. Install complete, separate conduit systems for all electrical systems on this project to include,
37 but not limited to include the following.
38 1. Electrical power
39 2. Control wiring furnished by this contractor
40 3. Other electrical systems
41

42 G. Branch circuits shall not be installed in or under the ground floor slab and will not be accepted.
43 The only exceptions being circuits and locations specifically required on the drawings to be in
44 or under the floor slab.
45

46 H. Aluminum conduit shall not be installed in direct contact with concrete or masonry
47 construction.
48

49
50 PART 2 PRODUCTS

51
52 2.1 CONDUITS AND FITTINGS
53

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- 1 2.1.1 MINIMUM SIZES
2
3 A. Do not use conduit sized less than 3/4 inch steel, 3/4 inch for PVC conduit, 3/8 inch flexible
4 metal conduit, for lengths not to exceed 72 inches supplying light fixtures.
5
- 6 2.1.2 RIGID METAL CONDUIT. (RSC) (RAC) (IMC)
7
8 A. Hot-dipped galvanized rigid steel (RSC), Intermediate Metallic (IMC) with zinc-coated threads
9 and an outer coating of zinc chromate, Rigid Aluminum (RAC) accepted.
10
11 B. Fittings:
12 1. Malleable iron, either cadmium plated or hot-dipped galvanized. Steel. Aluminum for
13 aluminum conduit. To be insulated throat at terminations.
14 2. Use of set screw or bolt-on connectors and couplings is not accepted.
15 3. Use deflection and expansion couplings with bonding jumpers at all expansion joints
16 where required. Steel Clamps.
17
18 C. Usage: Where exposed on interior and exterior of buildings including roof. All elbows of PVC
19 conduit. Within or penetrating concrete slabs (RSC only).
20
- 21 2.1.3 PVC COATED RIGID METAL CONDUIT
22
23 A. NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride
24 (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6 and
25 ETL PVC-001. The PVC coated galvanized rigid conduit must be ETL Verified to the Intertek
26 ETL SEMKO High Temperature H2O PVC Coating Adhesion Test Procedure for 200 hours.
27
28 B. Fittings
29 1. Malleable iron. Steel.
30 2. Use fittings listed and labeled as complying with UL514B.
31 3. Exterior Coating: Polyvinyl Chloride (PVC), minimum thickness of 40 mils.
32 4. Interior Coating: Urethane, minimum thickness of 2 mils.
33
34 C. Usage: Damp or wet locations. The stub-up from below grade to above grade
35
- 36 2.1.4 ELECTRICAL METALLIC TUBING (EMT)
37
38 A. Galvanized Electrical Steel, Galvanized Thin Wall, or Aluminum Tubing
39
40 B. Fittings: Set screw or compression type. Indenter type is not accepted. Die cast zinc. Pressure
41 cast. Malleable iron. Steel. Steel Clamps. To be insulated throat at terminations.
42
43 C. Usage: Concealed in interior walls and ceiling spaces. Exposed only in interior mechanical,
44 electrical rooms, and equipment rooms. Gyms, activity spaces, stages as directed, above 10'-
45 0" A.F.F. where exposed. Installation in or under the floor slab will not be accepted.
46
- 47 2.1.5 RIGID NONMETALLIC CONDUIT (RNC)
48
49 A. Schedule 40 heavy wall polyvinylchloride, high impact resistant.
50
51 B. Fittings: Solvent weld socket type
52
53 C. Usage: Underground, under slabs, all bends to be rigid steel. Do not penetrate slab with PVC.
54 Do not use above slabs, above grade, or exposed. Use long sweep rigid steel 90's and rigid
55 steel from 90's to and above grade.
56

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- 1 2.1.6 FLEXIBLE METAL CONDUIT (FMC)
2
3 A. Spiral-wound, square-locked aluminum. Spiral-wound, square locked, hot-dipped galvanized
4 steel.
5
6 B. Fittings: Cadmium plated two-screw, double-clamp malleable iron. Hot-dipped galvanized two-
7 screw, double-clamp malleable iron. Malleable. Pressure cast. Steel cast. Steel/Malleable for
8 90°. Zinc coated, aluminum. To be insulated throat at terminations.
9
10 C. Usage:
11 1. May be used for light fixture whips.
12 2. May be used for final equipment connections, such as transformers, motors and HVAC
13 equipment.
14 3. Total length not to exceed 72" above ceiling, 48" exposed below ceiling.
15 4. Exposed only in interior mechanical or electrical rooms.
16 5. For renovation work, may be used in existing walls only under the following conditions:
17 a. The use of EMT or rigid conduit is not feasible.
18 b. Written permission has been obtained from the engineer.
19 c. Surface mounted conduit is not desired.
20 6. Installation in or under the floor slab will not be accepted.
21
22 2.1.7 LIQUID-TIGHT FLEXIBLE METAL CONDUIT (LFC)
23
24 A. Spiral-wound, square-locked, hot-dipped galvanized steel strip plus a bonded outer jacket of
25 PVC.
26
27 B. Fittings:
28 1. Cadmium plated, compression type, malleable iron. Hot-dipped galvanized, compression
29 type, malleable iron. Steel. To be insulated throat at terminations.
30 2. Aluminum - Copper free (1% or less)
31
32 C. Usage:
33 1. Exterior equipment - 5' 0" Maximum length
34 2. Kitchen equipment - 4' 0" Maximum length
35
36 2.1.8 ACCEPTABLE MANUFACTURERS
37
38 A. Metallic Conduits: AFC, Alfex, Allied, American Conduit, Nepco, Nucor, Omega, Pittsburgh,
39 Spang, Western Tube and Wheatland.
40
41 B. Nonmetallic Conduits: Carlon, Sedco, and Cantex.
42
43 C. PVC Coated Metallic Conduits: Calbond, Plasti-Bond, Perma-Cote, and KorKap.
44
45 D. Fittings: Madison, Hubbell, Raco, Regal, Appleton, Thomas & Betts, Eaton, Steel City, and
46 ECN Korns.
47
48 E. Others: As listed with products.
49
50 2.2 WIREWAYS
51
52 A. Not less than 16 gauge sheet steel. Cross section dimensions not less than 4 inches by 4
53 inches, or as noted. ANSI gray epoxy paint over rust-inhibiting prime coat. NEMA rated. Large
54 enclosed surface metal raceway used where conduit is not accessible, or use of conduit is not
55 feasible.
56

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1 B. Manufacturers: Square D., Hoffman
2

3 2.3 METALLIC SURFACE RACEWAYS
4

5 A. Not less than 0.04" thickness sheet steel with enamel over rust-inhibiting prime coat, ivory
6 finish, not less than 0.25 square inch cross section.
7

8 B. One piece for up to 7 - #12 AWG wire capacity.
9

10 C. Two piece for up to 8 - #12 AWG wire or more capacity.
11

12 D. Usage: Exposed on existing classroom and public walls where concealment of EMT or FMC
13 is prohibitive, and/or in lieu of rigid metal conduit. Use deep boxes for mounting fire alarm
14 devices.
15

16 E. Manufacturers: Wiremold, Tehalit, Mono-Systems, Panduit
17

18 2.4 NON-METALLIC SURFACE RACEWAYS
19

20 A. Rigid polyvinyl chloride (PVC), ivory finish, not less than .20 square inch cross section. Two
21 piece construction, minimum 5 - #12 AWG wire capacity.
22

23 B. Usage: Exposed on existing walls, as noted on drawings, where concealment of EMT or FMC
24 and/or in lieu of rigid metal conduit is prohibitive. Use deep boxes for mounting fire alarm
25 devices.
26

27 C. Manufacturers: Tehalit, Wiremold, Hubbell, Mono-Systems, Panduit
28

29 2.5 POWER/DATA RACEWAYS
30

31 A. Wiremold AL4320 series, two compartment, with isolated ground duplex receptacles and data
32 devices as noted on drawings. Provide all required mounting accessories. Serve raceways
33 from flush outlet boxes mounted behind raceway as required and as directed.
34

35 PART 3 EXECUTION
36

37 3.1 PREPARATION
38

39 A. Place sleeves in the cavities of walls and floor slabs for the free passage of conduits.
40

41 B. Set sleeves in place a sufficient time ahead of concrete placement so as not to delay the work.
42

43 C. Apply caulking for sleeves through floors and through exterior walls.
44

45 D. Be sure that plugs or caps are installed before concrete placement begins.
46

47 3.2 INSTALLATION
48

49 3.2.1 CONDUITS
50

51 A. Metallic conduits must be continuous between enclosures such as outlet, junction and pull
52 boxes, panels, cabinets, motor control centers, etc. The conduit must enter and be secured to
53 enclosures so that each system is electrically continuous throughout. Where knockouts are
54 used, provide double locknuts, one on each side. At conduit terminations, provide insulated
55 throat fittings. Where conduits terminate in equipment having a ground bus, such as in
56 switchgear, and panelboards, provide conduit with an insulated grounding bushing.

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- 1 B. It is intended to reuse the existing conduits in existing construction, if they prove to be
2 adequate in size and integrity.
3
- 4 C. Install conduit and tubing products as indicated, in accordance with applicable requirements
5 of NEC and the NECA "Standard of Installation", and in accordance with recognized industry
6 practices to ensure that products serve the intended function.
7
- 8 D. Cap open ends of raceways until conductors are installed.
9
- 10 E. Wherever possible and unless otherwise indicated on the drawings, install conduit concealed
11 in walls, partitions and above the ceiling. Install conduit exposed in ceiling area at the structure
12 in electrical rooms, mechanical rooms and other rooms where ceilings are not present or
13 scheduled.
14
- 15 F. In mechanical rooms install conduit to equipment not adjacent to walls, by dropping conduits
16 exposed from overhead.
17
- 18 G. Install conduits parallel and supported on Unistrut or equal trapezes and anchored with split
19 ring hangers, conduit straps or other devices specifically designed for the purpose. Wire ties
20 are not permitted. Do not support conduit from ceiling system supports.
21
- 22 H. Installation of the PVC Coated Conduit System shall be performed in accordance with the
23 Manufacturer's Installation Manual. All clamping, cutting, threading, bending, and assembly
24 instructions listed in the manufacturer's installation guide should be followed To assure correct
25 installation, the installer shall be certified by Manufacturer to install coated conduit.
26
- 27 I. Liquid-tight flexible metal conduit on the roof shall be securely fastened in place by an
28 approved means within 12 inches of each box, cabinet, conduit body, or other conduit
29 termination, and shall be supported and secured at intervals not to exceed 4.5 feet. Flexible
30 conduit cannot lay on roof.
31
- 32 J. Have rigid nonmetallic conduit adequately solvent welded at joints to form a tight, waterproof
33 connection. Run green ground wire in all PVC conduit and extend to ground bus.
34
- 35 K. Run concealed conduit as directly and with the largest radius bends as possible. Run exposed
36 conduit parallel or at right angles to building or other construction lines in a neat and orderly
37 manner. Conceal conduit in finished areas. Branch circuits installed in or under slabs on grade
38 will not be accepted unless noted on drawings. Branch circuits shall be installed below floor
39 slabs above first floor.
40
- 41 L. Install each entire conduit system complete before pulling in any conductors. Clean the interior
42 of every run of conduit before pulling in conductors. See Section 26 05 19 Conductors for
43 additional requirements for installation of conductors in raceways.
44
- 45 M. Conduit and raceways shall be suspended from building structure, not from ceiling suspension
46 system.
47
- 48 N. Make bends with standard ells or conduit bent in accordance with the NEC. Make field bends
49 using equipment designed for the particular conduit material and size involved. Bends must
50 be free from dents or flattening. Use no more than the equivalent of four 90-degree bends in
51 any run between terminals and cabinets, or between outlets and junction boxes or pull boxes.
52
- 53 O. Securely fasten and support all conduit runs. Provide required clamps, straps, clips, hangers
54 and brackets. Raceways run in joists shall be secured to joists with clamps at 20'0" maximum
55 spacing. Raceways run parallel to joists shall be supported by caddy clips (1 inch or smaller)
56 or in unistrut/threaded rods/beam clamps trapeze at 15'-0" centers. Raceways run

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- 1 perpendicular to bottom of joists shall be secured with individual conduit hangers at 10'-0"
- 2 maximum spacing or unistrut/threaded rods/beam clamps at 15'-0" maximum centers.
- 3 Raceways supported by straps at walls shall be supported per NEC. Support all raceways
- 4 within one foot of each box, cabinet, disconnect, bend or other raceway termination.
- 5
- 6 P. Run flexible conduit to all recessed fluorescent fixtures in accessible ceilings. Do not use more
- 7 than 4 flexible metal conduits per junction box to supply light fixtures in a location. Do not
- 8 supply a fixture from another with any Raceway or FMC. Suspend junction boxes and conduits
- 9 from high roofs with hangers and trapeze.
- 10
- 11 Q. Provide two spare 1 inch conduits stubbed into attic space at flush mounted electrical cabinets.
- 12
- 13 R. Provide a Greenlee #431 or equal (240 lbs.) nylon pulling line in conduits in which wiring is
- 14 not installed under this work, such as telephone, signal, and similar systems. Identify both
- 15 ends of the line by means of labels or tags reading "Pulling Line".
- 16
- 17 S. Use expansion-deflection fittings on conduits 2 inches and larger crossing structural expansion
- 18 joints and on exposed conduit runs where necessary. Provide bonding jumpers across fittings
- 19 in metal raceway systems.
- 20
- 21 T. Openings around electrical penetrations of fire resistance rated walls, partitions, floors or
- 22 ceilings shall be made using approved methods so as to maintain the original fire resistance
- 23 rating. See NEC 300-21.
- 24

25 3.2.2 WIREWAYS

- 26
- 27 A. Install wireways, where noted or required. Field apply a 90 percent grey zinc paint coating
- 28 over cuts or scratches before any other finish is applied.
- 29

30 3.2.3 SURFACE RACEWAYS

- 31
- 32 A. Install surface raceways, where noted or required. At metallic raceways, field apply a 90
- 33 percent zinc paint coating to cuts or scratches before any other finish is applied.
- 34

35 3.2.4 COMMUNICATION SYSTEMS

- 36
- 37 A. This contractor shall provide all raceways and conduits for all communication systems shown
- 38 and/or required on the drawings. Communication Systems may include but are not limited to
- 39 fire alarms, intercoms, telephones, television, security, computer data, antenna and media
- 40 management.
- 41
- 42 B. This contractor shall provide a conduit pathway above ceiling for fire alarm, data, av systems,
- 43 etc. between all spaces and the corridor, where walls go to deck. Coordinate exact conduit
- 44 size (1" to 2") and quantity with low voltage contractors and installers.
- 45
- 46 C. Raceways and conduit requirements shall be coordinated by this contractor with each
- 47 Communication Systems Contractor and the general contractor.
- 48
- 49 D. See Specification Divisions 27 and 28 for additional requirements.
- 50

51 3.3 COLOR CODING

- 52
- 53 A. Provide color bands approximately two inches wide, applied at 10 foot centers and at pull box
- 54 locations.
- 55

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- 1 B. Color Codes:
2 1. Fire Alarm System Red
3 2. Voice/Data Blue
4 3. Security System Green
5 4. Media Management Yellow
6 5. CATV/MATV Black
7

8 3.4 LABELING
9

- 10 A. Type: Write-on markers with a laminating portion for protection. The writing portion shall be
11 white in color. The laminate portion shall be clear.
12
13 B. Installation:
14 1. Install the write-on markers with the protective laminates securely over the write-on
15 markers.
16 2. Install and label the write-on markers and laminates on conduits in accessible attic space
17 at 4 to 6 inches above the point where the conduit exits the wall. If a conduit cannot be
18 labeled in this manner, install and label the write-on markers and laminate behind the
19 cover plate of the systems electrical box.
20 3. Where a junction box is to be installed for future use, install and label the conduit on the
21 cover plate as outlined above as to the destination of the raceway (i.e. panelboard, fire
22 alarm panel, intercom panel, room name etc.).
23 4. Label all boxes in a legible manner.
24
25 C. Systems To Be Labeled:
26 1. CATV/MATV system
27 2. Fire Alarm system
28 3. Voice/Data system
29 4. Media Management system
30 5. Security system
31

32 END OF SECTION

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SECTION 26 05 33.13

BOXES AND FITTINGS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 26 00 00, apply to this Section.

1.2 SECTION INCLUDES

- A. Outlet boxes
- B. Junction boxes
- C. Pull and splice boxes

1.3 RELATED SECTION

- A. Section 26 00 00 - Electrical

1.4 REFERENCES

- A. ANSI/NEMA Publication No. OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers and Box Supports, and Cast Aluminum Covers.
- B. ANSI/UL 514 - Electrical Outlet Boxes and Fittings.
- C. NEC 370-23(d)

1.5 DESCRIPTION OF WORK

- A. The extent of electrical box and electrical fitting work is indicated by drawings and the requirements of this section.
- B. The types of electrical boxes and fittings required for the project include the following:
 - 1. Outlet boxes
 - 2. Junction boxes
 - 3. Pull boxes
 - 4. Conduit bodies

1.6 SUBMITTALS

- A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1, and Division 26, Section 26 00 90 requirements.
- B. Include cut sheets of fittings, cover plates, junction boxes, outlet boxes, pull boxes, floor boxes and extension rings. Provide samples upon specific request.

PART 2 PRODUCTS

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- 1 2.1 OUTLET BOXES
2
3 A. Flush Device Boxes
4 1. Galvanized steel boxes, with extension rings as required. Use 1½ inch deep by 4 inches
5 long, square or rectangular, unless otherwise noted on drawings.
6 2. Provide galvanized steel interior outlet wiring boxes of the type, shape and size, including
7 depth of box, to suit each respective location and installation; constructed with stamped
8 knockouts in back and sides, and with threaded holes with screws for securing box covers
9 or wiring devices.
10 3. In boxes with multiple switches, where the voltage between adjacent switches exceeds
11 300 volts, provide an enclosure equipped with identified, securely installed barriers
12 between adjacent devices.
13
14 B. Exterior or Exposed Device Boxes: Use FS or FD cast boxes with threaded hubs.
15
16 C. Interior Lighting Fixture Boxes: Galvanized steel with fixture stud supports and attachments to
17 properly support ceiling and bracket-type lighting fixtures. Provide galvanized steel interior
18 outlet wiring boxes of the type, shape and size, including depth of box, to suit each respective
19 location and installation; constructed with stamped knockouts in back and sides and with
20 threaded holes with screws for securing box covers or wiring devices. 1½ inch deep by 4
21 inches wide octagonal box, unless otherwise noted.
22
23 D. Masonry Boxes: Galvanized steel with gang capacity and extension ring covers to match the
24 number of devices installed.
25
26 2.2 JUNCTION, PULL AND SPLICE BOXES
27
28 A. Galvanized steel boxes conforming to NEC Article 370.
29
30 B. Use NEMA 1 type boxes at least 4 inches deep, interior spaces.
31
32 C. Use NEMA 3R type boxes at least 4 inches deep, exterior spaces.
33
34 D. Use NEMA 4 cast iron type with external recessed flanged cover when cast in concrete.
35
36 2.3 MANUFACTURERS
37
38 A. Appleton
39
40 B. Eaton
41
42 C. Hoffman
43
44 D. Hubbell
45
46 E. Keystone
47
48 F. Lew
49
50 G. Orbit Industries
51
52 H. Raceway Components
53
54 I. RACO
55
56 J. Stahlin

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1 K. Steel City

2
3 L. Thomas & Betts

4
5 M. Walker

6
7
8 **PART 3 EXECUTION**

9
10 **3.1 OUTLET BOXES**

11
12 **3.1.1 GENERAL**

13
14 A. The definition of an outlet, as it is used in this section, is to be per article 100 of NEC.

15
16 B. Provide all standard boxes, pull junction, wiring device and/or splice boxes for all systems in
17 walls and slabs.

18
19 C. All low voltage systems in attic or crawl spaces specified in Division 23 are not included.

20
21 D. At all ceiling-mounted receptacle and luminaire (exit light, pendants, linear direct/indirect, etc.)
22 locations, provide a heavy duty dual bar hanger with ceiling ties to support the back box.
23 Provide Cooper Industries BA50F or approved equal with appropriate back box for the
24 application.

25
26 E. All outlet boxes shall be mounted between joists and supported by both adjacent joists/studs,
27 not just one. All outlet boxes shall be supported by a rigid box support or mounting bracket
28 that stretches the entire length between the joists/studs and is mechanically fastened to
29 joists/studs at each end. Outlet boxes shall not be supported from only one side or by only
30 one joist/stud regardless of stud material. Provide a caddy H23, SGB, TSGB, RBS or similar
31 product.

32
33 **3.1.2 FLUSH BOXES**

34
35 A. Mount all outlet boxes flush within 1/4 inch of the finished wall or ceiling line unless otherwise
36 indicated. Provide knockout closures to cap unused knock out holes where knock out holes
37 have been removed. Install outlets flush with finish walls or ceiling surfaces for concealed
38 wiring.

39
40 B. Provide galvanized steel extension rings where required to extend the box forward in
41 conformance to NEC requirements. Attach ring with at least two machine screws. Install
42 electrical boxes and fittings in compliance with NEC requirements and in accordance with the
43 manufacturer's written instructions and with recognized industry practices to ensure that the
44 boxes and fittings serve the intended purposes.

45
46 C. Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring. Install blank
47 cover plates, painted to match surrounding, at pull boxes, junction boxes and all others to
48 which no fixture or device is to be attached.

49
50 D. Securely fasten outlet boxes in position using clips or other suitable means. Secure boxes
51 rigidly to the substrate upon which they are being mounted. Solidly embed boxes in concrete
52 or masonry. Boxes shall not be permitted to move laterally, or to be supported only by EMT or
53 conduit.

54
55 E. Provide plaster rings for all boxes in plastered walls and ceilings.

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- 1 F. Where more than one switch occurs at the same location, use multiple gang outlet boxes
2 covered by a single plate. Separate switches ganged in one box by a grounded metal barrier
3 where system voltage exceeds 150 volts to ground. Fittings shall be approved for grounding
4 purposes or shall be jumpered with a copper grounding conductor of appropriate ampacity.
5 Leave terminations of such jumpers exposed. Use masonry type boxes with square corners
6 in unplastered tile walls to allow tile to be sawed out neatly around box. Plates shall cover any
7 cracks between box and tile. Use oversize plates where necessary.
8

9 3.1.3 LIGHTING FIXTURE BOXES

- 10
11 A. Do not install boxes for suspended lighting fixtures which are attached to and supported from
12 suspended ceilings. Coordinate all lighting fixture outlets with mechanical and architectural
13 equipment and elements to eliminate conflicts and provide a workable neat installation. Install
14 approved 3/8" fixture studs in outlets from which lights are suspended, fastened through from
15 back of box. Anchor outlet boxes and particularly those supporting fixtures, securely in place
16 in an approved manner. Support outlet boxes and fixtures from building structures, not from
17 ceiling material. Provide yokes, channels, studs or other supporting materials as required.
18

- 19 B. At all exit luminaires installed in grid ceilings (T-grid), provide a Cooper Industries BA50F or
20 approved equal.
21

22 3.1.4 WALL MOUNTING HEIGHT

- 23
24 A. Mounting height of a wall-mounted outlet box means the height from finished floor to bottom
25 of box.
26

- 27 B. Where outlets are indicated adjacent to each other, mount these outlets in a symmetrical
28 pattern with all tops at the same elevation.
29

- 30 C. Remove and relocate any outlet box placed in an unsuitable location.
31

32 3.1.5 BACK-TO-BACK BOXES

- 33
34 A. Do not connect outlet boxes back to back unless prior approval from Engineer is obtained.
35

- 36 B. Where such a connection is necessary to complete a particular installation, fill the voids around
37 the wire between the boxes with sound insulating material.
38

39 3.1.6 BOX OPENINGS

- 40
41 A. Provide only the openings necessary to accommodate the conduits at each individual location.
42

43 3.2 JUNCTION, PULL AND SPLICE BOXES

44 3.2.1 INSTALLATION

- 45
46
47 A. Install boxes as required to facilitate cable installation in raceway systems.
48

- 49 B. Provide boxes in conduit runs of more than 100 feet or as required in Division 26.
50

- 51 C. Locate boxes strategically and make them of such shape to permit easy pulling of wire or
52 cables.
53

- 54 D. Locate exposed pull or junction boxes subject to the owner's representative's approval. Protect
55 boxes in such a manner as to prevent foreign material, such as plaster, from entering boxes.
56 Boxes shall be thoroughly cleaned of foreign materials before pulling conductors.

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1 E. Install and support boxes per NEC 314-23 as required and as directed.
2

3 3.2.2 COVERS
4

5 A. Provide boxes so that covers are readily accessible and easily removable after completion of
6 the installation.
7

8 B. Include suitable access doors for boxes above suspended ceilings.
9

10 C. Select a practical size for each box and cover.
11

12 D. Label covers with permanent "black" felt-tip marker. Circuit numbers shall be provided on
13 power covers.
14

15 E. Electrical systems shall be identified by painted junction boxes and covers with the following
16 scheme:

- 17 1. Lighting system: Yellow
 - 18 2. Emergency power system: Red
 - 19 3. 120V power system: Blue
 - 20 4. HVAC system power: Green
- 21

22 F. Fire alarm covers to be red in color, Steel City part number 52-C-1RD or equivalent.
23

24 3.3 LOCATION OF BOXES
25

26 A. The approximate location of boxes for switches, light outlets, power outlets, etc. is indicated
27 on the plans. These drawings, however, may not give complete and accurate information in
28 regard to locations of such items. The exact locations shall be determined by reference to the
29 general building plans and by actual measurements during construction of the building, subject
30 to the Architect's approval.
31

32 B. The Owner's representative reserves the right to make reasonable changes, up to six feet, in
33 the indicated locations before work is roughed in, without additional charge.
34

35 C. Unless otherwise shown or specified, install boxes for switches 44" and receptacles 18" above
36 finished floor. Verify all door swings with the drawings and schedules and locate switches and
37 pull stations, unless specifically noted otherwise, on the strike side of the door. If switch is
38 indicated on hinged side of door, verify location with the Owners Representative.
39

40 D. Where shown near doors, install wall switches shall be ganged in multiples as required
41 covered by a single multigang cover plate. Where convenience outlets, telephone outlets, or
42 data processing equipment outlets are near each other, outlet boxes shall be joined or
43 otherwise placed so that they are all the same level. Device plates shall match for all outlets.
44

45 END OF SECTION

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SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

1.1.1 SECTION INCLUDES

- A. Identification required for electrical systems.
- B. Code required identification not shown on plans nor specified herein shall be provided.

1.1.2 RELATED SECTIONS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Division 26, Section 26 00 00, apply to this Section.
- B. See the following sections for related work.
 - 1. Section 26 00 00 - Electrical
 - 2. Section 26 00 90 - Electrical Submittal Procedures
 - 3. Section 26 28 16 - Enclosed Switches and Circuit Breakers

1.2 SUBMITTALS

1.2.1 PRODUCT DATA

- A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1 and Division 26, Section 26 00 90 requirements.
- B. Submit product data for sign materials. Refer to Electrical Identification detail on drawings for additional information.

1.2.2 QUALITY ASSURANCE/CONTROL SUBMITTALS

- A. After the owner's room number list is finalized, submit a list of all electrical identification tags. The list shall include the actual text that will appear on each tag. Include the owner's and architects room numbers on all tags. This list shall be submitted for the review of the owner and architect.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Sign Materials:
 - 1. Type:
 - a. Engraving-Stock
 - b. Melamine plastic laminate
 - 2. Thickness:
 - a. Less than 25 square inches:
 - (1) 1/16 inch
 - b. 25 square inches or more:
 - (1) 1/8 inch

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- 1 3. Color: Black Conform to FS L-P-287
2
3 B. Lettering:
4 1. Style: Engraved standard print, unless otherwise indicated.
5 2. Size: 3/16 inch to 1/4 inch
6 3. Color: White
7
8 2.2 SIGN INFORMATION
9
10 A. Panelboard:
11 1. Data:
12 a. Panelboard designation
13 b. Voltage, phase and wires
14 c. Source of service
15 2. Example:
16 a. CHAC
17 b. 277/480V., 3-phase, 4-wire
18 c. Fed from MDP
19
20 B. Switchboard:
21 1. Data:
22 a. Switchboard designation
23 b. Source of service
24 c. Panel type
25 d. Style
26 e. Amperage
27 f. Neutral amperage
28 g. Voltage of each branch circuit designation.
29 h. Phase and wires.
30 2. Example:
31 a. DPC - 277/480V.
32 b. 3 phase
33 c. 4 wire
34 d. Fed from MDP
35
36 C. Safety Switches:
37 1. Data:
38 a. Switch or load served designation.
39 b. Voltage and phase.
40 2. Example: In the following example, the text in parenthesis does not go on the actual tag.
41 It is for clarification only.
42 a. #112 (Owner's Room Number)
43 b. A/C #C206 (Architect's Room Number)
44 c. Circ. CHAC-15
45 d. 480V.
46 e. 3 phase
47
48 D. Time Clocks:
49 1. Data:
50 a. Time clock load(s) served
51 b. Voltage and phase
52 c. Source of service
53 2. Examples:
54 a. Parking Lot Lights
55 b. 480V.

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- 1 c. Single Phase
2 d. Fed from CH-15
3
4 E. Soffit Lights
5 1. 277V.
6 2. Fed from CH-21
7
8 F. Water Heater:
9 1. 208V.
10 2. Single phase
11 3. Fed from AL2-25
12
13 G. Electrical Riser Diagram Signs:
14 1. Material:
15 a. Provide laminated copy of electrical riser diagram and screw to wall in each
16 electrical room.
17 2. Size:
18 a. Minimum: 12" x 17"
19 b. Maximum: 30" x 42"
20 3. Provide a riser diagram in each electrical room similar to the riser diagram shown on the
21 plans, and/or as required for the area served.
22
23 H. Device Engraving:
24 1. Any switch for load that is not in sight of the equipment served: custom engrave on
25 outside of switch cover plate.
26 2. Custom engrave switch function when called for on the plans.
27
28 I. Panelboard Directory:
29 1. For each panelboard, provide a directory-frame mounted inside the door with heat-
30 resistant transparent face and a directory card for identifying the load served.
31 2. Identify circuits by equipment served on by room numbers where room numbers exist.
32 Room numbers shall be as directed by Owner.
33 3. Verify nomenclature at job site.
34 4. Directory shall be typed, shall coordinate with panel breaker and be neat.
35 5. Indicate spares and spaces with erasable pencil.
36
37 J. Nameplate Fasteners:
38 1. Securely attach nameplates to equipment with non-corroding stainless steel screws.
39 2. Non-corroding pop rivets are acceptable.
40 3. Stick-ons or adhesives will not be allowed.
41
42

43 PART 3 EXECUTION

44
45 3.1 PREPARATION

- 46
47 A. Coordinate with the architect to obtain a list of the finalized owner's room number list.
48
49 B. Prepare the quality control submittal of tag data as described in the Submittals article of this
50 specification.
51
52 C. After the submittal has been reviewed without comment by the architect and the owner,
53 proceed to order the identification tags.
54
55 D. Tags with incorrect data that have not been reviewed without comment by the architect and
56 owner do not comply with these specifications.

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- 1 3.2 INSTALLATION
2
3 A. Provide signs for equipment requiring identification as shown on drawings and for equipment
4 as required by National Electric Code.
5
6 B. Provide for each main disconnect not grouped together.
7
8 C. Refer to Section 26 28 16 for Enclosed Switches and Circuit Breakers.
9
10 D. Install signs on outside of cover for safety switches and time clocks.
11
12 E. Install signs on outside top, not on door, and at each circuit for panelboards, switchboards and
13 motor control centers.
14
15 F. Label spares and blank spares in light, erasable pencil.
16
17 G. Mount in an easily visible location.
18
19 H. All labeling identification shall contain both the owner's and architect's room names and
20 numbers. Coordinate with General Contractor to secure construction room numbers.
21
22 I. Provide all additional signage required by local authority at no cost to the Owner.
23
24

END OF SECTION

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SECTION 26 08 00

COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

A. Commissioning:

1. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
 - a. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
 - b. Verify and document proper performance of equipment and systems.
 - c. Verify that O&M documentation is complete.
 - d. Verify that the Owner's operating personnel are adequately trained
2. The systems to be commissioned include: electrical switchgear and panels, emergency power systems (if included), UPS Systems (if included), electrical and lighting controls, fire alarm system, and life safety systems and controls.
3. Commissioning requires the participation of affected Division contractors to ensure that all systems are operating in a manner consistent with the Contract Documents. All affected Division contractors shall be familiar with all parts of the commissioning plan issued by the CA (Commissioning Authority) and shall execute all commissioning responsibilities assigned to them in the Contract Documents.
4. Commissioning Team:
 - a. The members of the commissioning team consist of the Commissioning Authority (CA), the designated representative of the owner, the General Contractor (GC or Contractor), the Architect and Design Engineers, the Mechanical Contractor (MC), the Electrical Contractor (EC), the Controls Contractor (CC), the Fire Alarm Contractor, and any other installing subcontractors or suppliers of equipment. The Owner's building or plant operator/engineer is also a member of the commissioning team.

1.2 COMMISSIONING AUTHORITY

- A. The commissioning authority and/or agency shall be selected and employed by the building owner. The commissioning agent shall be a licensed professional engineer in the State where the work will be performed, and shall be experienced in the commissioning of mechanical and electrical systems of the type installed in this project. Experience in construction process, direct digital control systems, test and balance and ASHRAE Guideline 1 - 1998 is mandatory. The commissioning agent shall not be associated with or employed by a mechanical contractor, or equipment supplier.

1.3 COMMISSIONING PLAN

A. Commissioning Plan:

1. The commissioning plan provides guidance in the execution of the commissioning process. Just after the initial commissioning scoping meeting the CA will provide the plan, which will continue to evolve and expand as the project progresses. The Specifications will take precedence over the Commissioning Plan.

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B. Commissioning Process:

1. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.
2. Commissioning during construction begins with a scoping meeting conducted by the CA where the commissioning process is reviewed with the commissioning team members.
3. Additional meetings will be required throughout construction, scheduled by the CA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems. Generally, these meetings will be included with or will be sequential with regular subcontractor meetings.
4. Equipment documentation is submitted to the CA during normal submittals, including detailed start-up procedures.
5. The CA works with the Subs in developing startup plans and startup documentation formats, including prefunctional checklists to be completed, during the startup process.
6. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with prefunctional checklists being completed before functional testing.
7. The Subcontractors, under their own direction, execute and document the prefunctional checklists and perform startup and initial checkout. The CA documents that the checklists and startup were completed according to the approved plans. This may include the CA witnessing start-up of selected equipment and systems.
8. The installing contractors, suppliers and manufacturers, develops specific equipment and system functional performance test procedures with the assistance of the CA.
9. The procedures are executed by the Subcontractors, under the direction of, and documented by the CA.
10. Items of non-compliance in material, installation or setup are corrected at the Subcontractor's expense and the system retested.
11. The CA reviews the O&M documentation for completeness. All O&M documentation must be submitted and approved before the start of training.
12. Commissioning shall be completed before Substantial Completion.
13. The CA reviews, pre-approves and coordinates the training provided by the Subs and verifies that it was completed.
14. Deferred testing is conducted, as specified or required.

1.4 RESPONSIBILITIES

A. General Contractor (GC):

1. Facilitate the coordination of the commissioning work by the CA, and with the CA ensure that commissioning activities are being scheduled into the master schedule.
2. Include the cost of commissioning in the contract price.
3. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CA.
4. In each purchase order or subcontract written, include requirements for submittal data, Systems/O&M data, commissioning tasks and training.
5. Ensure that all Subs execute their commissioning responsibilities according to the Contract Documents and schedule.
6. A representative shall attend a commissioning scoping meeting and other necessary meetings scheduled by the CA to facilitate the Commissioning process.
7. Coordinate the training of owner personnel.
8. Prepare Systems/O&M manuals and Systems manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

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- 1 B. Warranty Period:
- 2 1. Ensure that Subcontractors execute seasonal or deferred functional performance testing,
- 3 witnessed by the CA, according to the specifications.
- 4 2. Ensure that Subs correct deficiencies and make necessary adjustments to O&M manuals
- 5 and as-built drawings for applicable issues identified in any seasonal testing.
- 6
- 7 C. Electrical Contractors and Sub-Contractors:
- 8 1. The commissioning responsibilities applicable to each of the subcontractors are generally
- 9 as follows (all references apply to commissioned equipment only). Specific requirements
- 10 are shown in the appropriate Divisions.
- 11 2. Construction and Acceptance Phases
- 12 a. Include the cost of commissioning in the contract price.
- 13 b. In each purchase order or subcontract written, include requirements for submittal
- 14 data, commissioning documentation, Systems/O&M data and training.
- 15 c. Attend a commissioning scoping meeting and other meetings necessary to facilitate
- 16 the Commissioning process.
- 17 d. Contractors shall provide the CA with normal cut sheets and shop drawing
- 18 submittals of commissioned equipment as part of the normal submittal process.
- 19 e. Provide additional requested documentation, prior to normal O&M manual
- 20 submittals, to the CA for development of start-up and functional testing procedures.
- 21 (1) Typically this will include detailed manufacturer installation and start-up,
- 22 operating, troubleshooting and maintenance procedures, full details of any
- 23 owner-contracted tests, full factory testing reports, if any, and full warranty
- 24 information, including all responsibilities of the Owner to keep the warranty in
- 25 force clearly identified. In addition, the installation, start-up and checkout
- 26 materials that are actually shipped inside the equipment and the actual field
- 27 checkout sheet forms to be used by the factory or field technicians shall be
- 28 submitted to the Commissioning Authority.
- 29 (2) The Commissioning Authority may request further documentation necessary
- 30 for the commissioning process.
- 31 f. Provide a copy of the Systems/O&M manuals and submittals of commissioned
- 32 equipment, through normal channels, to the CA for review and approval.
- 33 g. Contractors shall assist (along with the design engineers) in clarifying the operation
- 34 and control of commissioned equipment in areas where the specifications, control
- 35 drawings or equipment documentation is not sufficient for writing detailed testing
- 36 procedures.
- 37 h. Provide assistance to the CA in preparing the specific functional performance test
- 38 procedures. Subs shall review test procedures to ensure feasibility, safety and
- 39 equipment protection and provide necessary written alarm limits to be used during
- 40 the tests.
- 41 i. Develop a full start-up and initial checkout plan using manufacturer's start-up
- 42 procedures and the prefunctional checklists from the CA for all commissioned
- 43 equipment. Submit to CA for review and approval prior to startup.
- 44 j. During the startup and initial checkout process, execute the prefunctional checklists
- 45 for all commissioned equipment.
- 46 k. Perform and clearly document all completed startup and system operational
- 47 checkout procedures, providing a copy to the CA.
- 48 l. Address current A/E punch list items before functional testing
- 49 m. Provide skilled technicians to execute starting of equipment and to execute the
- 50 functional performance tests. Ensure that they are available and present during the
- 51 agreed upon schedules and for sufficient duration to complete the necessary tests,
- 52 adjustments and problem solving.
- 53 n. Perform functional performance testing under the direction of the CA for specified
- 54 equipment. Assist the CA in interpreting the monitoring data, as necessary.
- 55 o. Correct deficiencies (differences between specified and observed performance) as
- 56 interpreted by the CA, and A/E and retest the equipment.

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- 1 p. Prepare Systems/O&M manuals according to the Contract Documents, including
- 2 clarifying and updating the original sequences of operation to as-built conditions.
- 3 q. Prepare redline as-built drawings for all drawings and final as-builds for contractor-
- 4 generated coordination drawings.
- 5 r. Provide training of the Owner's operating personnel as specified.
- 6 s. Coordinate with equipment manufacturers to determine specific requirements to
- 7 maintain the validity of the warranty.
- 8
- 9 D. Warranty Period:
- 10 1. Execute seasonal or deferred functional performance testing, witnessed by the CA,
- 11 according to the specifications.
- 12 2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built
- 13 drawings for applicable issues identified in any seasonal testing.
- 14
- 15 E. Equipment Suppliers:
- 16 1. Provide all requested submittal data, including detailed start-up procedures and specific
- 17 responsibilities of the Owner to keep warranties in force.
- 18 2. Assist in equipment testing per agreements with Subs.
- 19 3. Include all special tools and instruments (only available from vendor, specific to a piece
- 20 of equipment) required for testing equipment according to these Contract Documents in
- 21 the base bid price to the Contractor, except for stand-alone data logging equipment that
- 22 may be used by the CA.
- 23 4. Provide information requested by CA regarding equipment sequence of operation and
- 24 testing procedures.
- 25 5. Review test procedures for equipment installed by factory representatives.
- 26
- 27 F. Commissioning Authority (CA):
- 28 1. The CA is not responsible for design concept, design criteria, compliance with codes,
- 29 design or general construction scheduling, cost estimating, or construction management.
- 30 The CA may assist with problem-solving non-conformance or deficiencies, but ultimately
- 31 that responsibility resides with the general contractor and the A/E. The primary role of the
- 32 CA is to develop and coordinate the execution of a testing plan, observe and document
- 33 performance - that systems are functioning in accordance with the documented design
- 34 intent and in accordance with the Contract Documents. The Contractors will provide all
- 35 tools or the use of tools to start, checkout and functionally test equipment and systems,
- 36 except for specified testing equipment supplied and installed by the CA.
- 37 a. Coordinates and directs the commissioning activities in a logical, sequential and
- 38 efficient manner using consistent protocols and forms, centralized documentation,
- 39 clear and regular communications and consultations with all necessary parties,
- 40 frequently updated timelines and schedules and technical expertise.
- 41 b. Coordinate the commissioning work and, with the GC, ensure that commissioning
- 42 activities are being scheduled into the master schedule.
- 43 c. Revise, as necessary, Commissioning Plan—Construction Phase.
- 44 d. Plan and conduct a commissioning scoping meeting.
- 45 e. Request and review additional information required to perform commissioning tasks,
- 46 including Systems/O&M materials, contractor start-up and checkout procedures.
- 47 f. Before startup, gather and review the current control sequences and interlocks and
- 48 work with contractors and design engineers until sufficient clarity has been obtained,
- 49 in writing, to be able to write detailed testing procedures.
- 50 g. Review and approve normal Contractor submittals applicable to systems being
- 51 commissioned for compliance with commissioning needs, along with A/E reviews.
- 52 h. Perform site visits, as necessary, to observe component and system installations.
- 53 Attend selected planning and job-site meetings to obtain information on construction
- 54 progress. Review construction meeting minutes for revisions/substitutions relating
- 55 to the commissioning process. Assist in resolving any discrepancies.

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- 1 i. Approve pre-functional tests and checklist completion by reviewing prefunctional
- 2 checklist reports and by selected site observation and spot checking.
- 3 j. Approve systems startup by reviewing start-up reports and by selected site
- 4 observation.
- 5 k. Review the functional performance test procedures for equipment and systems
- 6 developed by the subcontractors and suppliers. This may include energy
- 7 management control system trending, or manual functional testing.
- 8 l. Coordinate, witness and approve manual functional performance tests performed by
- 9 installing contractors. Coordinate retesting as necessary until satisfactory
- 10 performance is achieved.
- 11 m. Review equipment warranties to ensure that the Owner’s responsibilities are clearly
- 12 defined.
- 13 n. Oversee and approve the training of the Owner’s operating personnel.
- 14 o. Compile and maintain a commissioning record.
- 15 p. Review and approve the preparation of the Systems/O&M manuals.
- 16 q. Provide a final commissioning report.

17
18 G. Warranty Period:

- 19 1. Coordinate and supervise required seasonal or deferred testing and deficiency
- 20 corrections.
- 21 2. Return to the site at 10 months into the 12-month warranty period and review with facility
- 22 staff the current building operation and the condition of outstanding issues. Also interview
- 23 facility staff and identify problems or concerns they have operating the building as
- 24 originally intended. Make suggestions for improvements and for recording these changes
- 25 in the Systems/O&M manuals. Identify areas that may come under warranty or under the
- 26 original construction contract. Assist facility staff in developing reports, documents and
- 27 requests for services to remedy outstanding problems.

28
29 H. Scheduling:

- 30 1. The CA will work with the GC according to established protocols to schedule the
- 31 commissioning activities. The CA will provide sufficient notice to the CM and GC for
- 32 scheduling commissioning activities. The GC will integrate all commissioning activities
- 33 into the master schedule. All parties will address scheduling problems and make
- 34 necessary notifications in a timely manner in order to expedite the commissioning
- 35 process.

36
37
38 PART 2 PRODUCTS

39
40 2.1 TEST EQUIPMENT

- 41
- 42 A. All standard testing equipment required to perform startup and initial checkout and required
- 43 functional performance testing shall be provided by the Division contractor for the equipment
- 44 being tested.
- 45
- 46 B. Special equipment, tools and instruments (only available from vendor, specific to a piece of
- 47 equipment) required for testing equipment, according to these Contract Documents shall be
- 48 included in the base bid price to the Contractor and left on site.
- 49
- 50 C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system
- 51 performance with the tolerances specified in the Specifications.
- 52

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1 PART 3 EXECUTION
2

3 3.1 MEETINGS
4

- 5 A. Scoping Meeting:
 - 6 1. Within 90 days of commencement of construction, the CA will schedule, plan and conduct
 - 7 a commissioning scoping meeting with the entire commissioning team in attendance.
 - 8 Meeting minutes will be distributed to all parties by the GC. Information gathered from
 - 9 this meeting will allow the CA to revise the Commissioning Plan to its "final" version, which
 - 10 will also be distributed to all parties.
- 11 B. Miscellaneous Meetings:
 - 12 1. Other meetings will be planned and conducted by the CA as construction progresses.
 - 13 These meetings will cover coordination, deficiency resolution and planning issues with
 - 14 particular subs. The CA will plan these meetings and will minimize unnecessary time
 - 15 being spent by Subs.
 - 16

17
18 3.2 REPORTING
19

- 20 A. The CA will regularly communicate with all members of the commissioning team, keeping them
- 21 apprised of commissioning progress and scheduling changes through memos, progress
- 22 reports, etc.
- 23
- 24 B. Testing or review approvals and non-conformance and deficiency reports are made regularly
- 25 with the review and testing as described in later sections.
- 26
- 27 C. A final summary report by the CA will be provided focusing on evaluating commissioning
- 28 process issues and identifying areas where the process could be improved. All acquired
- 29 documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved
- 30 issues, etc., will be compiled in appendices and provided with the summary report.
- 31

32 3.3 SUBMITTALS
33

- 34 A. The CA will provide appropriate contractors with a specific request for the type of submittal
- 35 documentation the CA requires to facilitate the commissioning work. These requests will be
- 36 integrated into the normal submittal process and protocol of the construction team. At
- 37 minimum, the request will include the manufacturer and model number, the manufacturer's
- 38 printed installation and detailed start-up procedures, full sequences of operation,
- 39 Systems/O&M data, performance data, any performance test procedures, control drawings
- 40 and details of owner contracted tests. In addition, the installation and checkout materials that
- 41 are actually shipped inside the equipment and the actual field checkout sheet forms to be used
- 42 by the factory or field technicians shall be submitted to the Commissioning Authority. All
- 43 documentation requested by the CA will be included by the Subs in their Systems/O&M
- 44 manual contributions.
- 45
- 46 B. The Commissioning Authority will review and approve submittals related to the commissioned
- 47 equipment for conformance to the Contract Documents as it relates to the commissioning
- 48 process, to the functional performance of the equipment and adequacy for developing test
- 49 procedures. This review is intended primarily to aid in the development of functional testing
- 50 procedures and only secondarily to verify compliance with equipment specifications. The
- 51 Commissioning Agent will notify the appropriate persons as requested, of items missing or
- 52 areas that are not in conformance with Contract Documents and which require resubmission.
- 53
- 54 C. The CA may request additional design narrative from the A/E and Controls Contractor,
- 55 depending on the completeness of the design intent documentation and sequences provided
- 56 with the Specifications.

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1
2 3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT
3

4 A. The following procedures apply to all equipment to be commissioned. Some systems that are
5 not comprised so much of actual dynamic machinery may have very simplified PCs and
6 startup.
7

8 B. General:

9 1. Prefunctional checklists are important to ensure that the equipment and systems are
10 hooked up and operational. It ensures that functional performance testing (in-depth
11 system checkout) may proceed without unnecessary delays. Each piece of equipment
12 receives full prefunctional checkout. No sampling strategies are used. The prefunctional
13 testing for a given system must be successfully completed prior to formal functional
14 performance testing of equipment or subsystems of the given system.
15

16 C. Start-up and Initial Checkout Plan:

17 1. The CA shall assist the commissioning team members responsible for startup of any
18 equipment in developing detailed start-up plans for all equipment. The primary role of the
19 CA in this process is to ensure that there is written documentation that each of the
20 manufacturer-recommended procedures have been completed. Parties responsible for
21 prefunctional checklists and startup are identified in the commissioning scoping meeting
22 and in the checklist forms. Parties responsible for executing functional performance tests
23 are identified in the testing requirements.

24 a. The CA assist in the development of checklists that indicate required procedures to
25 be executed as part of startup and initial checkout of the systems and the party
26 responsible for their execution.

27 b. The Contractor determines which trade is responsible for executing and
28 documenting each of the line item tasks and notes that trade on the form. Each form
29 may have more than one trade responsible for its execution.

30 c. The subcontractor responsible for the purchase of the equipment develops the full
31 start-up plan by combining (or adding to) the CA's checklists with the manufacturer's
32 detailed start-up and checkout procedures from the O&M manual and the normally
33 used field checkout sheets. The plan will include checklists and procedures with
34 specific boxes or lines for recording and documenting the checking and inspections
35 of each procedure and a summary statement with a signature block at the end of the
36 plan.

37 d. The full start-up plan could consist of something as simple as:

38 (1) The contractor and CA prefunctional checklists.

39 (2) The manufacturer's standard written start-up procedures copied from the
40 installation manuals with check boxes by each procedure and a signature block
41 added by hand at the end.

42 (3) The manufacturer's normally used field checkout sheets.

43 e. The subcontractor submits the full startup plan to the CA for review and approval.

44 f. The CA reviews and approves the procedures and the format for documenting them,
45 noting any procedures that need to be added.

46 g. The full start-up procedures and the approval form may be provided to the CM for
47 review and approval, depending on management protocol.
48

49 D. Execution of Prefunctional Checklists and Startup:

50 1. Four weeks prior to startup, the Subs and vendors schedule startup and checkout with
51 the GC and CA. The performance of the prefunctional checklists, startup and checkout
52 are directed and executed by the Sub or vendor. When checking off prefunctional
53 checklists, signatures may be required of other Subs for verification of completion of their
54 work.

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- 1 2. The CA shall observe, at minimum, the procedures for each piece of primary equipment,
2 unless there are multiple units, (in which case a sampling strategy may be used as
3 approved).
- 4 3. For lower-level components of equipment the CA shall observe a sampling of the
5 prefunctional and start-up procedures.
- 6 4. The Subs and vendors shall execute startup and provide the CA with a signed and dated
7 copy of the completed start-up and prefunctional tests and checklists.
- 8 5. Only individuals that have direct knowledge and witnessed that a line item task on the
9 prefunctional checklist was actually performed shall initial or check that item off.
- 10
- 11 E. Deficiencies, Non-Conformance and Approval in Checklists and Startup:
12 1. The Subcontractors shall clearly list any outstanding items of the initial start-up and
13 prefunctional procedures that were not completed successfully, at the bottom of the
14 procedures form or on an attached sheet. The procedures form and any outstanding
15 deficiencies are provided to the CA within two days of test completion.
- 16 2. The CA shall work with the Subcontractors and vendors to correct and retest deficiencies
17 or uncompleted items. The CA will involve the CM or GC and others as necessary. The
18 installing Subcontractors or vendors shall correct all areas that are deficient or incomplete
19 in the checklists and tests in a timely manner, and shall notify the CA as soon as
20 outstanding items have been corrected and resubmit an updated start-up report and a
21 Statement of Correction on the original non-compliance report. When satisfactorily
22 completed, the CA recommends approval of the execution of the checklists and startup
23 of each system using a standard form.
- 24

25 3.5 FUNCTIONAL TESTING

- 26
- 27 A. This sub-section applies to all commissioning functional testing for all divisions.
28 1. Objectives and Scope:
29 a. The objective of functional testing is to demonstrate that each system is operating
30 according to the documented design intent and Contract Documents. Functional
31 testing facilitates bringing the systems from a state of substantial completion to full
32 dynamic operation. Additionally, during the testing process, areas of deficient
33 performance are identified and corrected, improving the operation and functioning
34 of the systems.
- 35 b. In general, each system should be operated through all modes of operation where
36 there is a specified system response. Verifying each sequence in the sequences of
37 operation is required.
- 38 2. Development of Test Procedures:
39 a. Before test procedures are written, the CA shall obtain all requested documentation
40 and a current list of change orders affecting equipment or systems, including an
41 updated points list, program code, control sequences and parameters. Each Sub or
42 vendor responsible to execute a test, shall provide assistance to the CA in
43 developing the procedures review (answering questions about equipment,
44 operation, sequences, etc.). Prior to execution, the CA shall provide a copy of the
45 test procedures to the Sub(s) who shall review the tests for feasibility, safety,
46 equipment and warranty protection. The CA may submit the tests to the A/E for
47 review, if requested.
- 48 b. The purpose of any given specific test is to verify and document compliance with the
49 stated criteria of acceptance given on the test form.
- 50 3. Test Methods:
51 a. Functional testing and verification may be achieved by manual testing (persons
52 manipulate the equipment and observe performance) or by monitoring the
53 performance and analyzing the results. The CA will determine which method is most
54 appropriate for tests that do not have a method specified.

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- 1 4. Coordination and Scheduling:
2 a. The Subs shall provide sufficient notice to the CA regarding their completion
3 schedule for the prefunctional checklists and startup of all equipment and systems.
4 The CA will schedule functional tests through the GC and affected Subcontractors.
5 The CA shall direct, witness and document the functional testing of all equipment
6 and systems. The Subs shall execute the tests.
7 b. In general, functional testing is conducted after prefunctional testing and startup has
8 been satisfactorily completed. Testing proceeds from components to subsystems to
9 systems. When the proper performance of all interacting individual systems has
10 been achieved, the interface or coordinated responses between systems is checked.

11
12 3.6 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS
13

14 A. Documentation:

- 15 1. The CA shall witness and document the results of all functional tests using the specific
16 procedural forms developed for that purpose. Prior to testing, these forms are provided
17 to the GC for review and approval and to the Subs for review. The CA will include the
18 filled out forms in the Commissioning Report.
19

20 B. Non-Conformance:

- 21 1. The CA will record the results of the functional test on the procedure or test form. All
22 deficiencies or non-conformance issues shall be noted and reported on a standard non-
23 compliance form.
24 2. Corrections of minor deficiencies identified may be made during the tests at the discretion
25 of the CA. In such cases the deficiency and resolution will be documented on the
26 procedure form.
27 3. Every effort will be made to expedite the testing process and minimize unnecessary
28 delays, while not compromising the integrity of the procedures.
29 4. As tests progress and a deficiency is identified, the CA discusses the issue with the
30 executing contractor.
31 a. When there is no dispute on the deficiency and the Sub accepts responsibility to
32 correct it:
33 (1) The CA documents the deficiency and the Sub's response and intentions and
34 they go on to another test or sequence
35 b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is
36 responsible:
37 (1) The deficiency shall be documented on the non-compliance form with the Sub's
38 response and a copy given to the GC and to the Subcontractor representative
39 assumed to be responsible.
40 (2) Resolutions are made at the lowest management level possible. Other parties
41 are brought into the discussions as needed. Final interpretive authority is with
42 the A/E. Final acceptance authority is with the Owner.
43 (3) Once the interpretation and resolution have been decided, the appropriate party
44 corrects the deficiency, signs the statement of correction on the non-
45 compliance form and provides it to the CA. The CA reschedules the test and
46 the test is repeated until satisfactory performance is achieved.
47

48 C. Cost of Retesting:

- 49 1. The cost for the Subcontractor to retest a prefunctional or functional test, if they are
50 responsible for the deficiency, shall be theirs. If they are not responsible, any cost
51 recovery for retesting costs shall be negotiated with the GC.
52 2. The Contractor shall respond in writing to the CA at least as often as commissioning
53 meetings are being scheduled concerning the status of each apparent outstanding
54 discrepancy identified during commissioning. Discussion shall cover explanations of any
55 disagreements and proposals for their resolution.
56 3. The CA retains the original non-conformance forms until the end of the project.

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- 3 D. Failure Due to Manufacturer Defect:
- 4 1. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute
- 5 a difference) of equipment fail to perform to the Contract Documents (mechanically or
- 6 substantively) due to manufacturing defect, not allowing it to meet its submitted
- 7 performance spec, all identical units may be considered unacceptable. In such case, the
- 8 Contractor shall provide the Owner with the following:
- 9 a. Within one week of notification, the Contractor or manufacturer's representative shall
- 10 examine all other identical units making a record of the findings. The findings shall
- 11 be provided within two weeks of the original notice.
- 12 b. Within two weeks of the original notification, the Contractor or manufacturer shall
- 13 provide a signed and dated, written explanation of the problem, cause of failures,
- 14 etc. and all proposed solutions which shall include full equipment submittals. The
- 15 proposed solutions shall not significantly exceed the specification requirements of
- 16 the original installation.
- 17 c. The Owner will determine whether a replacement of all identical units or a repair is
- 18 acceptable.
- 19 d. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all
- 20 identical items, at their expense and extend the warranty accordingly, if the original
- 21 equipment warranty had begun. The replacement/repair work shall proceed with
- 22 reasonable speed beginning within one week from when parts can be obtained.
- 23
- 24 E. Approval:
- 25 1. The CA notes each satisfactorily demonstrated function on the test form. The CA
- 26 recommends acceptance of each test using a standard form. The Owner gives final
- 27 approval on each test using the same form, providing a signed copy to the CA and the
- 28 Contractor.

29 3.7 SYSTEMS/OPERATION AND MAINTENANCE (O&M) MANUALS

- 30
- 31 A. The following Systems/O&M manual requirements do not replace O&M manual
- 32 documentation requirements elsewhere in these specifications.
- 33
- 34 B. Each Division shall compile and prepare documentation for all equipment and systems
- 35 covered in that Division and deliver this documentation to the GC for inclusion in the
- 36 Systems/O&M manuals, according to this section, prior to the training of owner personnel.
- 37
- 38 C. The CA shall receive a copy of the O&M manuals for review.
- 39
- 40 D. Field checkout sheets and logs should be provided to the CA for inclusion in the
- 41 Commissioning Record Book.
- 42
- 43 E. Review and Approvals:
- 44 1. Review of the commissioning related sections of the Systems/O&M manuals shall be
- 45 made by the A/E and by the CA.
- 46

47 3.8 TRAINING OF OWNER PERSONNEL

- 48
- 49 A. The GC shall be responsible for training coordination and scheduling and ultimately to ensure
- 50 that training is completed.
- 51
- 52 B. The CA shall be responsible for overseeing and approving the content and adequacy of the
- 53 training of Owner personnel for commissioned equipment.
- 54

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3.9 WRITTEN WORK PRODUCTS

- A. Written work products of Contractors will consist of the start-up and initial checkout plan described and the filled out start-up, initial checkout and prefunctional checklists, manufacturer's factory and field testing and inspection forms, contractors' inspection and functional testing forms, Systems/O&M Manuals, training plans and training records.
- B. These work products will be supplied to the CA to be included in the final commissioning report.

END OF SECTION

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
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SECTION 26 08 11

TESTING OF ELECTRICAL SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Division 1 Specifications and Section 26 00 00, apply to this Section.

1.2 SECTION INCLUDES

- A. Complete testing and evaluations to assure that the electrical system is installed for proper operation.

1.3 RELATED SECTIONS

- A. Section 26 00 00 - Electrical
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems

1.4 REFERENCES

- A. Biddle Instruments #21-P8a - Electrical Insulation Testing
- B. Biddle Instruments #25Ta - Earth Resistance Testing

1.5 COORDINATION

- A. Coordinate special tests and/or equipment start-up as specified or implied in related sections.

1.6 SUBMITTALS

- A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1, and Division 26, Section 26 00 90 requirements. Included in this section are megger tests of all main feeders to all switchboards and/or panelboards. Submit tests of insulation resistance, conductor resistance, and ground resistance.

PART 2 PRODUCTS

- A. Not used.

PART 3 EXECUTION

3.1 TESTING

- A. Perform in accordance with manufacturer's printed testing procedures, applicable industry standards, ANSI standards, IEEE standards, NEMA standards and as directed by the Engineer. Provide testing equipment in good working order and which complies with the applicable industry standards and manufacturer's requirements. Include a list of testing equipment used and date of last calibration.

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- B. Test the following:
 1. Feeder conductors from switchboard to panelboards.
 2. Grounding of the Electrical system neutral: Ground resistance shall not exceed 10 ohms.
 3. Equipment grounds for each feeder: Ground resistance shall not exceed 25 ohms.
 4. Insulation resistance: Ground resistance shall not be less than one (1) megohm.
 - C. Perform all tests in the presence of the Engineer, Architect or the Owner in accordance with the forms included in this section. Perform grounding resistance testing in the presence of the Commissioning authority.
 - D. Submit each test form within ten (10) working days from the time the test is performed.
 - E. Document all test results and provide a signed report by the testing technician as witnessed. Reports shall include date, time, weather conditions, field conditions, test data, instruments used and brief description of the test. Include reports in operating manuals. Submit tests.

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Job Name: _____

Person and Company Conducting Test: _____

Signature of Person Conducting Test: _____

Insulation Test Results (Megger)

Feeder Description	Test Date	Resistance (megohms)	Remarks

Notes:

1. Test shall be conducted after conductors are pulled.
2. Ground resistance on insulation shall be no less than one (1) megohm.
3. Make copies of this form if more blanks are needed.

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Job Name: _____

Person and Company Conducting Test: _____

Signature of Person Conducting Test: _____

Transformer Test Results

Transformer	Test Date	Secondary Voltage	Tap Setting	Grounding of Transformer Neutral (ohms)	Remarks

Notes:

- 1. Test on transformer neutral and tap settings shall be performed at time of substantial completion.
- 2. Ground resistance of transformer neutral shall be no greater than ten (10) ohms.
- 3. Make copies of this form if more blanks are needed.

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Job Name: _____

Person and Company Conducting Test: _____

Signature of Person Conducting Test: _____

Feeder Ground Test Results

Feeder	Test Date	Resistance (ohms)	Remarks

- Notes:
1. Test shall be conducted at time of substantial completion.
 2. Ground resistance shall not exceed 25 ohms.
 3. Make copies of this form if more blanks are needed.

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Job Name: _____

Person and Company Conducting Test: _____

Signature of Person Conducting Test: _____

System Neutral Ground Test Results

Feeder	Test Date	Unbonded resistance (megohms) see note 1	Bonded resistance (ohms) see note 2	Remarks

Notes:

1. Neutral is not bonded to equipment and/or ground at any location. Resistance shall not be less than one (1) megohm.
2. Neutral is connected to ground at transformer only. Resistance shall not exceed 25 ohms.
3. Test shall be performed at time of substantial completion.
4. Make copies of this form if more blanks are needed.

END OF SECTION

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
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SECTION 26 09 16

ELECTRICAL CONTROL COMPONENTS

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PART 1 GENERAL

1.1 SUMMARY

1.1.1 SECTION INCLUDES

- A. Time switches for lighting control.
- B. Time switches for circulating pumps.

1.1.2 RELATED SECTIONS

- A. Section 26 00 00 - Electrical
- B. Section 26 00 90 - Electrical Submittal Procedures
- C. Section 26 05 53 - Electrical Identification
- D. Section 26 28 16 - Enclosed Switches and Circuit Breakers

1.2 SUBMITTALS

- A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 1 and Division 26, Section 26 00 90 requirements.
- B. Product Data: Submit product data for time switches.
- C. Samples: Provide a non-returnable sample when requested.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Water Heater Time Clocks & Batteries:
 - 1. Tork Model EH10/20 Digital Control Clock
 - 2. Intermatic ET2725C
 - 3. Battery Backup - 9V lithium or super capacitor good for at least 100hrs.
- B. All other manufacturers shall require pre-approval in accordance with specification section 26 00 90 - Electrical Submittal Procedures.

2.2 MATERIALS

- A. Case:
 - 1. Indoor/outdoor Nema 3R enclosure made of self-extinguishing high impact plastic or steel with corrosion resistant paint.

PART 3 EXECUTION

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1 3.1 INSTALLATION
2

- 3 A. Install near the panelboard supplying service to load per manufacturer's direction.
4
5 B. Mount time switch not more than 12" above top of switchgear and so that the time switch is
6 readily accessible.
7
8 C. Programming:
9 1. Program the time switches as directed. Include programming and operating instructions
10 in "Records for Owner" as outlined in Section 26 00 00.
11 2. Instruct the Engineer in setting the switches before final inspection.
12
13 D. Label Time Clock.
14

15 3.2 WATER HEATER TIME CLOCKS
16

- 17 A. Provide a Digital Control Clock for each water heater. Located time clock in electrical room
18 and label "Water Heater - (Location)".
19
20 B. Provide power to each water heater time clock from the same circuit as the general purpose
21 receptacle in the electrical room or from the same circuit as the circulation pump or from the
22 nearest acceptable 120v circuit using a 20A breaker and #12 wire or greater.
23
24 C. Set to Operate:
25 1. On: 7:00 a.m.
26 2. Off: 11:00 a.m.
27 3. On: 2:00 p.m.
28 4. Off: 6:00 p.m.
29 5. Off: Saturdays and Sundays
30
31 D. Timer to control both the water heater and any circulating pump. Circulating pump to run
32 continuously as long as water heater is operational. When the water heater is intentionally
33 turned off to conserve energy, then turn off the circulating pump.
34
35 E. Provide mechanically held contactor for each water heater circulating pump.
36
37 F. Provide a non-fused disconnect at each water heater. Refer to Section 26 28 16 for Enclosed
38 Switches and Circuit Breakers.
39

40 END OF SECTION

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SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SUMMARY

1.1.1 SECTION INCLUDES

- A. Safety Switches
- B. Disconnect Switches

1.1.2 RELATED SECTIONS

- A. Section 26 00 00 - Electrical
- B. Section 26 00 90 - Electrical Submittal Procedures
- C. Section 26 05 53 - Electrical Identification
- D. Section 26 43 00 - Surge Protective Devices (SPD)

1.2 REFERENCES

- A. ANSI/UL 98 - Safety Standard for Enclosed Switches.
- B. NEMA KS 1 - Enclosed Switches.

1.3 SYSTEM DESCRIPTION

- A. Safety switches shall be of the same manufacturer as distribution switchgear.
- B. Both the safety switch and disconnect are to indicate the requirement for a fused disconnecting means, unless a non-fused disconnect is specifically requested on the contract drawings.
- C. The extent of safety switches, disconnect switches is indicated on the drawings and by the requirements of this section.
- D. In accordance with the service indicated, use 240 or 600 volt switches, single throw, fusible, or non-fusible, horsepower rated, 100% load break and make rated, designed for locking in "ON" or "OFF" position, in code gauge steel cabinets, as required by the application and the N.E.C.
- E. Use switches which have number of poles required, dependent on equipment requirements.
- F. Use NEMA 3R switches where exposed to weather, with weatherproof threaded hubs for top or side conduit entries into switch.
- G. Use fuse clips which are rejecting type to accept Class RK or L fuses only.
- H. Size fuses serving motor loads at 125% to 175% of motor nameplate rating, or the next standard size and as specifically recommended by motor or equipment manufacturer.

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1 I. Provide a manual switch at each motor, class 2510 Square D, for motors shown with "MS."
2 Provide a 20-AMP rated switch at each motor not otherwise noted.

3
4 J. Where switches/breakers are listed as requiring GFCI protection in specifications or drawings,
5 coordinate with the equipment manufacturer to provide proper GFCI requirements to
6 determine whether they are intended to be for personnel (5ma) or equipment (30ma).

7
8 1.4 SUBMITTALS

9
10 A. Submittals required in this section shall conform to and be submitted in accordance with the
11 General Conditions, Division 1 and Division 26, Section 26 00 90 requirements.

12
13 1.5 PRODUCT DATA

14
15 A. Submit product data for the following.
16 1. Safety and Disconnect Switches

17
18
19 PART 2 PRODUCTS

20
21 2.1 MANUFACTURERS

22
23 A. Siemens

24
25 2.2 SWITCHES

26
27 A. Provide safety switches and disconnects with a voltage rating suitable for the nominal voltage
28 of the system in which they are to be applied. Contacts are quick-make, quick-break.

29
30 B. Provide surge protective devices in accordance with section 26 43 00.

31
32 2.3 CIRCUIT BREAKERS

33
34 A. All circuit breakers that have an overcurrent trip setting fixed or adjustable to 1200A or higher
35 shall have an Energy-Reducing Maintenance Switch or similar approved method for arc
36 energy reduction and shall meet all requirements of NEC 240.87.

37
38 2.4 CONSTRUCTION

39
40 A. Indoor dry locations, 30 amp thru 100 amp, use NEMA 1 general duty (GD).

41
42 B. All outdoor locations use NEMA 3R heavy duty (HD).

43
44 C. The handle shall be suitable for padlocking in the OFF position. Defeatable, front accessible,
45 coin-proof door interlock to prevent opening the door when the switch is in the ON position
46 and to prevent turning the switch ON when the door is open. Incoming line terminals with an
47 insulated shield.

48
49
50 PART 3 EXECUTION

51
52 3.1 INSTALLATION

53
54 A. Mount switches no more than 6 inches above and within 6 feet of the equipment served at the
55 direction of the Engineer, so that operating handle is easily accessible. Align tops of switches
56 when grouped together.

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- B. Provide a housekeeping pad for all free standing or floor mounted safety switches whether they are mounted inside or outside.
 - C. Mount vertically on required separate support system hardware with switch easily accessible (door to open 90 degrees minimum).
 - D. Permanently mount safety switches from inside with plated or stainless bolts, toggle bolts or anchors.
 - E. Exposed mounting bolts, screws, etc. are not acceptable.
 - F. Permanently install fusible switches with class R fuse kits so that fuses are readable when looking at open switch.
 - G. Do not mount switches/disconnects to access panels or on nameplate data or equipment.
 - H. Installation of Conductors: Switches shall not be used as “junction boxes” between HVAC units (splicing or “pig tailing” is not permitted). The maximum number of conductors allowed per termination is determined by the manufacturer’s approved rating for each terminal or lug. Multiple conductor configurations shall be highlighted in the contractor’s submittal package. Exceptions to this rating must be obtained in writing from the engineer’s office on a case by case basis.
 - I. Coordinate and verify exact fuse sizes with mechanical contractor. Fuses shown on drawings are based on one manufacturer. Fuse sizes vary depending on manufacturer.
 - J. Identification: Refer to Section 26 05 53 for Electrical Identification. Provide nameplate identification on all HVAC equipment regardless of equipment location.

END OF SECTION

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
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SECTION 26 43 00

SURGE PROTECTIVE DEVICES (SPD)

PART 1 GENERAL

1.1 SUMMARY

A. This section supplements section 26 00 00 Electrical and contains additional requirements applicable to surge protective devices.

1.2 SECTION INCLUDES

- A. Surge protective devices (SPD) provided in accordance with NEC article 285.
- B. SPD for phone, data, security and other systems.

1.3 RELATED SECTIONS

- A. Section 26 00 00 - Electrical
- B. Section 26 00 90 - Electrical Submittal Procedures

1.4 REFERENCES

- A. NEC - NFPA 70 National Electrical Code, most current edition
- B. UL 1449 - Underwriters Laboratories, UL 1449, Standard for Safety, Surge Protection Devices 4th Edition March 2016 Type 1, Type 2 and Type 3 Protectors
- C. ANSI/IEEE C62: Complete C62: Complete 1990 Edition: Guides and Standards for Surge Protection
- D. UL 497 Paired Conductor Communications Circuits

1.5 SUBMITTALS

- A. Submit in accordance with Section 26 00 90 Electrical Submittal Procedures.
- B. Product Data: Submit product data for all SPD used on this project. Provide evidence that SPD are listed to the most current edition of UL1449 by an OSHA approved safety testing agency (i.e. UL, ETL, or CSA). Provide a submittal package that includes specifications and 3rd party testing and listing letters.

1.6 WARRANTY

- A. All surge suppression devices and supporting components shall be guaranteed by the installing contractor to be free of defects in materials and workmanship for a period of five years minimum excluding installation labor. Lightning damage to the SPD is not grounds for voiding any/all warranties of the SPD.

PART 2 PRODUCTS

**CIMARRON ELEMENTARY SCHOOL HVAC UPGRADES AND REPLACEMENT
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1 2.1 MANUFACTURERS
2

- 3 A. Subject to compliance with requirements, provide products by one of the following.
4 1. ACT Communications
5 2. Eaton Corporation (formerly Cutler Hammer)
6 3. Emerson - Liebert
7 4. ABB (formerly GE Industrial)
8 5. Mersen (formerly Ferraz Shawmut)
9 6. Schneider Electric - Square D
10 7. Surge Suppression – ILSCO
11 8. ERICO

12 2.2 MANUFACTURED UNITS
13

- 14 A. Technology: Construction shall be metal oxide varister (MOV) componentry with bidirectional
15 operation.
16
17 B. Protection Modes: Provide at least seven mode protection (L-N, L-G, N-G) with discrete
18 protection elements on each mode.
19
20 C. Protection: Each SPD shall be protected upstream by a dedicated UL rated fuse or
21 disconnecting means.
22
23 D. Filtering: Provide surge protection plus filtering of disruptive noises, EMI/RFI interference to
24 >-40db from 3kHz to 1 MHz according to Mil-Std 220A.
25
26 E. Listing and ratings: SPD shall be tested and performance rated per UL1449. Clamping voltage
27 shall be clearly stated on both submittals and equipment installed.
28
29 F. Voltage ratings:
30
31

Rated Line Voltage	Maximum Continuous Operating Voltage (MCOV)	Voltage Protection Rating (VPR)
120/240; 120/208 volt	150 volts	700 volts (L-N, L-G), 1200 (L-L)
240/480; 277/480 volt	320 volts	1200 volts (L-N, L-G), 1800 (L-L)
480 volts (2 ph. Delta)	600 volts	1800 volts (L-G), 3000 (L-L)

- 32 G. Alarms and monitoring: Provide SPD with the following.
33 1. LED indicator lights for power and protection status.
34 2. Audible alarm, with silencing switch, to indicate when protection has failed.
35 3. One set of dry contacts rated at 5A and 240V for remote monitoring of protection.
36
37 H. SPD at the electrical service entrance (main distribution panel or main service disconnecting
38 means) shall meet the following additional criteria.
39 1. Modular construction and field replaceable.
40 2. Bus Bar connected for low impedance connections.
41 3. UL rated as Type 1 and Type 2 SPD device
42 4. SCCR: 200kAIC
43 5. Nominal Discharge Current (I_n): 20,000 amperes (8 x 20 us waveform)
44 6. Maximum Single Impulse Current rating: >135,000 amperes (8 x 20 us waveform) / mode.
45 7. Repetitive Surge testing per IEEE C62.41.2 C3 10,000 amps: 20,000 impulses
46
47

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- 1 I. SPD at electrical sub-panels shall meet the following additional criteria.
2 1. Modular or System construction
3 2. UL rated as Type 2 device
4 3. SCCR: 100kAIC or no less than specified rating of the electrical subpanel.
5 4. Nominal Discharge Current (I_n): 20,000 amperes (8 x 20 us waveform)
6 5. Maximum Single Impulse Current rating: >65,000 amperes (8 x 20 us waveform) / mode.
7 6. Repetitive Surge testing per IEEE C62.41.2 C3 10,000 amps: >2,500 impulses
8
9 J. SPD at rooftop units and condensers shall meet the following additional criteria.
10 1. NEMA 4X enclosure suitable for outdoor installation
11 2. Nipple-mounted
12 3. SCCR: 100kAIC
13 4. Squared D SDSA series or equivalent.
14
15 K. Receptacles with Type 3 SPD installed - Use only when one or two outlets need SPD and
16 panel is not readily available:
17 1. SPD in a receptacle is able to employ a maximum of two IEC 320 receptacles (NEMA 5-
18 20R) and shall be rated not more than the current rating of the SPD and voltage rating
19 consistent with the voltage rating of the SPD.
20 2. A SPD receptacle used for outdoor use shall comply with the outdoor requirements in UL
21 498 and shall be provided with a receptacle hood which is weather-proof.
22 3. Permanently wired with high visibility LED indicator and/or damage alert beeper
23 4. Minimum Transient Suppression:
24 a. MCOV and VPR matches section 2.2 B 4
25 b. 6,500 amp peak current in each mode
26 5. Manufacturers:
27 a. Pass and Seymour 6262 Series
28 b. Hubbell 8200 H Series
29 c. Leviton 5300 Series
30 d. Wiremold "Sentrex 52TB2" series
31
32 L. SPD for telephone, video, data and alarm lines shall meet the following criteria.
33 1. Comply with appropriate UL 497, 497A, 497B and 497C standards for secondary
34 protectors.
35 2. Technology can be Gas Tube, Silicon Avalanche Diode or hybrid.
36 3. Rate Line Voltage (RMS): 150V for phone, 24V for data and control.
37 4. Maximum single line impulse 10,000 amps (8/20 us current waveform).
38 5. Clamp Voltage (Pair): Tip to ground and Ring to ground: 300 volts
39 6. Pulse Life: 1,000 - 3KA - 8/20 NS impulse with drift.
40 7. Maximum Continuous Operating Voltage: 180 VAC tip to ground, 180 VAC ring to ground
41
42

43 **PART 3 EXECUTION**

44
45 **3.1 INSTALLATION**

- 46
47 A. For new construction, provide SPD at each of the following locations. For renovations and
48 additions, provide SPD at the following locations which are affected by the project but do not
49 already have SPD.
50 1. Each electrical service entrance equipment.
51 2. Each main computer panelboard and at each isolated ground panelboard.
52 3. At all emergency systems switchboards and panelboards.
53 4. At each panelboard noted on drawings in addition to above requirements.
54 5. On all outdoor rooftop HVAC units and on all condensing unit switches. Mount to bottom
55 of switch or as recommended by the manufacturer.

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6. One SPD power outlet at each energy management control panel located by project controls contractor.
 7. At each new telephone and data incoming line.
 8. On all new video or alarm system wire entering from the outside of the facility.
 9. In or on each fire pump controller in accordance with NEC 2017 Article 695.15.

END OF SECTION