

PROJECT MANUAL

PROJECT NAME:

CBC District 2 Marshalltown Geothermal System Replacement

PROJECT ADDRESS:

1401 South 17th Ave
Marshalltown, Iowa 50158

PROJECT DATE: February 09, 2024

OWNER:

Iowa Department of Administrative Services
109 Southeast 13th Street
Des Moines, Iowa 50319



OWNER PROJECT NUMBER: 9362.00

OWNER REQUEST FOR BID NUMBER: RFB #936200-01

CONSTRUCTION MANAGER:

DCI Group
220 SE 6th Street - Suite 200
Des Moines, Iowa 50309



CONSTRUCTION MANAGER PROJECT NUMBER: 23-045

ARCHITECT:

Shive Hattery
2839 Northgate Drive
Iowa City, Iowa 52245



ARCHITECT PROJECT NUMBER: 2112309630

COMMISSIONING AGENT:

SystemWorks LLC
409 5th St.
West Des Moines, IA 50265



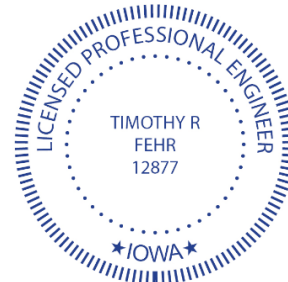
SECTION 00 0107

SEALS PAGE

I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge.

Discipline: Mechanical

Stamp:



Company Name: Shive-Hattery, Inc

Address: 2839 Northgate Dr, Iowa City, IA 52245

Telephone: 319.354.3040

Name: Timothy R. Fehr

Responsibility: Section 23

License#: 12877

I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge.

Discipline: Electrical

Stamp:



Company Name: Shive-Hattery, Inc

Address: 2839 Northgate Dr, Iowa City, IA 52245

Telephone: 319.354.3040

Name: Jake J. Henkle

Responsibility: Section 26

License#: 12668

END OF SECTION

SECTION 00 0110

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SECTION 00 0115

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DRAWINGS

1.01	SHEET	TITLE
A.	G000	COVER SHEET
B.	M100	SITE PLAN
C.	M101	MECHANICAL FLOOR PLANS, DETAILS, AND SCHEDULES
D.	M102	CONTROLS AND DETAILS
E.	E101	FLOOR PLANS, DETAILS, AND SCHEDULES

END OF SECTION

SECTION 00 0116

BID SUBMITTAL CHECKLIST

PART 1 - GENERAL

1.01 BID SUBMITTAL CHECKLIST

- A. The Bidder is responsible to see that the bid is submitted online at [IMPACS Electronic Procurement System](#) on or before the due date and time specified. Late bids shall not be accepted.
- B. Bids shall be typewritten or in ink. All information requested shall accompany the bid. All blocks shall be completed. Errors shall be lined out and initialed.
- C. The right is reserved to reject any or all bids. The State may waive minor deficiencies or informalities in the best interest of the State of Iowa.
- D. A properly prepared and submitted bid document is the bidder's responsibility.
- E. Bids cannot be changed after the bid opening.
- F. In all cases, no verbal communications by any party will override written communications from the issuing office.
- G. The Bid Form shall be completed in full and signed and submitted by an officer of the bidder with authority to bind in a contract.
- H. If Bid Bond is called for, it shall accompany the Bid submission.
- I. If Non-discrimination Clause information is called for, it shall accompany the Bid submission.
- J. If Targeted Small Business Pre-bid Contact information is called for, it shall accompany the Bid submission.
- K. If Certificate of Site Visit form is called for, it shall accompany the Bid submission.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 00 1113

NOTICE TO BIDDERS

RFB #936200-01

The Iowa Department of Administrative Services will be receiving bids for the replacement of existing open loop geothermal system for new closed loop system at the Community Based Corrections Facility located at 1401 South 17th Ave, Marshalltown, Iowa 50158.

The Iowa Department of Administrative Services anticipates construction to begin on March 15, 2024 and end by June 17, 2024.

Bids must be received no later than 2:00 PM, Friday, March 1, 2024. Late bids will not be considered. Bids shall be submitted on [IMPACS Electronic Procurement System](#). The Bid shall be accompanied by a Bid Security as set forth in the Instructions to Bidders in the amount of 5% of the total bid amount. Each bid shall be accompanied by a bid bond, cashier's check or a certified check drawn upon a solvent bank chartered under the laws of the United States of America.

Bid Opening

The time and place of bid opening will be held at meet.google.com/ogi-wwvo-dya and teleconference number (US)+1 515-446-9195 Pin: 320 868 775# at 3:00 pm on March 1, 2024.

The Iowa Department of Administrative Services reserves the right to reject any and all bids, and to waive irregularities and to accept a bid that is deemed in the best interest of the State of Iowa.

Bidders must comply with all affirmative action/equal employment opportunity provisions of the State of Iowa and the Federal Government.

This project is exempt from Iowa Sales Tax. Davis Bacon Wages **will not** apply to this project.

Questions must be submitted by 2:00 PM, Thursday, February 23, 2024 to the Issuing Officer.

Bidding documents may stipulate a specific product. Substitute product will be considered if a written request is received by 2:00 pm, February 19, 2024, prior to bid opening. Substitution requests will be considered for all products per Section 01 2500 Substitution Procedures, even if the specification does not include a statement such as "or equal," "equal to," "equivalent to," or "basis of design," unless otherwise noted.

An **optional** Pre-Bid meeting will be held on Tuesday, February 20th, 2024 at 11:00 am at Community Based Correction Facility at 1401 South 17th Ave, Marshalltown, Iowa 50158. This meeting is not mandatory but is highly recommended.

Bidding Documents, including drawing sheets bearing the project name 9362.00 – DOC CBC District 2 Marshalltown Geothermal System Replacement, Dated 02/09/24 and the Project Manual prepared by Shive-Hattery dated 02/09/24 may be obtained from Rapids Reproduction by visiting <https://www.rapidsreproplanroom.com> or by calling (319) 364-2473 on Monday, February 12, 2024.

For further information regarding this project contact:

Michael Bradbury – Issuing Officer

Phone: (515) 823-9327

E-Mail: construction.procurement@iowa.gov

END OF SECTION

SECTION 00 2113

INSTRUCTIONS TO BIDDERS

RFB #936200-01

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Project Description
- B. Owner
- C. State Agency Representatives and Contacts
- D. Proposal Form and Submissions
- E. Taxes
- F. Alternate Bids
- G. Drawings
- H. Bid Security
- I. Due Date and Time for Receipt of Bids
- J. Commencement and Completion Date
- K. Site Visit
- L. Pre-bid Meeting
- M. Questions
- N. Addenda and Interpretations of the Contract Documents
- O. Substitutions
- P. Obligation of Bidder
- Q. Public Records and Requests for Confidential Treatment
- R. Withdrawal of Bid
- S. Bid Closing
- T. Basis of Bids
- U. Informalities/Rejection of Bids
- V. Consideration of Bids
- W. Preference
- X. Qualifications
- Y. Insurance
- Z. Form of Agreement between Owner and Contractor
- AA. Execution of Contract
- BB. Laws and Regulations
- CC. Contract Documents and Order of Precedence
- DD. Conditions of the Work
- EE. Subcontracts
- FF. Project Manual/Drawings

1.02 PROJECT DESCRIPTION

- A. Project Description: Replacement of existing open loop geothermal system for new closed loop system at the Community Based Corrections Facility located at 1401 South 17th Ave, Marshalltown, Iowa 50158.

1.03 OWNER

- A. State of Iowa, Department of Administrative Services, 109 SE 13th St, Des Moines, IA 50319

1.04 STATE AGENCY REPRESENTATIVES AND CONTACTS

- A. PURCHASING AGENT: Mike Bradbury – Issuing Officer, State of Iowa, Department of Administrative Services, Hoover State Office Building, 3rd floor, 1305 East Walnut Street, Des Moines, IA 50319-0105, Phone: 515-823-9327; email: construction.procurement@iowa.gov
- B. OWNER REPRESENTATIVE: Brad Tonyan, State of Iowa, Department of Administrative Services, 109 SE 13th Street, Des Moines, IA 50319, Phone: 515-360-7718; email: brad.tonyan@iowa.gov
- C. ON-SITE COORDINATOR: Kent Bracy, Building Maintenance Coordinator, 1401 South 17th Avenue, Marshalltown, Iowa 50158, Phone: 641-485-0910; email: kent.bracym@iowa.gov
- D. CONSTRUCTION MANAGER CONTACT: Michael Steen, DCI Group, 220 SE 6th Street Suite #200, Des Moines, IA 50309, Phone: 515-975-8348; email: michaels@dcigroup-us.com
- E. DESIGN PROFESSIONAL CONTACT: Mike Jensen, Shive-Hattery, 2839 Northgate Drive, Iowa City, IA 52245, Phone: 319-430-7837; email: mjensen@shive-hattery.com

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 PROPOSAL FORM AND SUBMISSION

- A. A properly prepared and submitted bid is the bidder's responsibility. Bids are to be made in accordance with these Instructions to Bidders and items included on the Bid submission. Failure to comply may be cause for rejection.
- B. The Bid is to consist of the required Bid information, together with the other information specified below to be submitted with the Bid, in which copies are included with these Bidding Documents.
 - 1. The total bid package submitted is required to include the following:
 - a. An online submission including:
 - 1) Required Bid Form (To be uploaded online)
 - 2) Required Non-discrimination Clause Information
 - 3) Required Targeted Small Business Pre-bid Contact Information
 - 4) Bid Security (documentation provided by Bidder) (To be uploaded online) (Required)
 - 5) Certification of Site Visit (To be uploaded online if Pre-Bid is Mandatory)
- C. Include the amount for performing all work described in the drawings and specifications for Base Bid and for each Alternate Bid requested.
- D. Acknowledge receipt of all Addenda issued, where so indicated on the Bid Form
- E. All required information to be submitted, by an officer of the company having authority to bind the company in a contract.
- F. Commencement of the work of the contract shall begin with the Contractor's receipt of a fully executed contract (signed by both parties).
- G. The Owner reserves the right to award a contract for Base Bid only, or for Base Bid in combination with any, or all, identified Alternate Bids. The Owner reserves the right to award a contract for individual Bid Packages, or any combination of Bid Packages. Each Bidder must comply with all of the General Requirements of the project and any requirements of the Project manual that apply to their scope of work.
- H. The company's Federal I.D. Number and the Iowa Contractors Registration Number shall be included in the Bid Form.
- I. Unless indicated otherwise, the Bid shall be for a single responsibility contract for all work as indicated on the Drawings and specified in the Project Manual, and shall be a lump sum amount. If no change in the Base Bid amount is required with respect to consideration of a particular Alternate Bid, enter "No Change" in the blank for that Alternate Bid.
- J. Where so requested, provide Unit Prices for the designated types of work and in the units specified, in which the Unit Prices would be used as adjustments to the quantities described in the instructions as the basis for the Base Bid and any Alternate Bid work. A Unit Price would be

applicable in the event the Owner should request additional work of that type beyond the extent and quantity that has been established as the scope of the work by graphic delineation and notations on the Drawings, or by otherwise stipulating in the Bidding Documents a numerical quantity of the work, for the Bidder's use in determining the lump sum bid amount for the Base Bid and any requested Alternate Bid containing such work. The Unit Prices shall also be used to adjust the Contract Amount for actual quantities of work involved when the work subject to Unit Price adjustment differs by being less in quantity than that contemplated by the original scope of work for the respective Base Bid or Alternate Bid.

- K. Completed State of Iowa Nondiscrimination Clause information and Subcontractor Targeted Small Business Enterprise Pre-Bid Contact Information, included in these Bidding Documents, are to accompany the Bid submission. Bidders shall comply with all affirmative action/equal opportunity provisions of State and Federal laws. The Owner seeks to provide opportunities for Targeted Small Businesses in accordance with the provisions of Chapter 73 of the Code of Iowa.
- L. All Bid information is to be submitted online. Any required Bid Security shall be provided, in the form and amount specified elsewhere in these Instructions to Bidders, at the time of submission of the Bid. When a site visit is mandatory as specified elsewhere in these Instructions to Bidders, and a Certificate of Site Visit is required to be submitted with the Bid as evidence of such visit having occurred for purposes of observing the conditions of the site and the work proposed therein, the Certificate shall be uploaded with the bid submission.

3.02 TAXES

- A. In accordance with Section 423 of the Code of Iowa and 701-19 of the Iowa Administrative Rules, Iowa Construction Sales Tax Exemption Certificates for this project will be issued. Do not include Iowa sales tax or use tax, or any local option sales tax, on construction materials in determining your bid prices. The successful Contractor will be required to notify the Department of Administrative Services project manager of all Subcontractors within forty-eight (48) hours after the published date and time by which bids must be submitted. Information on the Contractor and each Subcontractor shall include the firms' name, address, contact person, federal tax identification number, and the Iowa contractor registration number. For the Contractor and each Subcontractor, designate the type of trade or category of work that is to be provided on the project. The Construction Manager for the Department of Administrative Services must be informed when any Subcontractor is added to the project. Following receipt of the information, the Construction Manager for the Department of Administrative Services will arrange to have an authorization letter and certificate (please see sample, included in the Project Manual) issued on behalf of the Contractor and each Subcontractor and will forward the documents to the Contractor for distribution and use by each in purchasing construction materials for this project. Certificates issued for this project shall be used for tax-exempt purchasing construction materials for this project only.

3.03 ALTERNATE BIDS

- A. Bidders are to bid all Alternates requested on the Bid Form. Alternates quoted will be reviewed and accepted or rejected at the option of the Department of Administrative Services. Accepted Alternates will be identified in the Owner-Contractor agreement. Indicate the price for Alternates described, as shown on the Drawings and specified in the Project Manual, and identify in the correct location on the Bid Form.

3.04 DRAWINGS AND PROJECT MANUAL

- A. Drawings and Project Manual are specified in the Notice to Bidders or any extension thereof made by Addendum.

3.05 BID SECURITY

- A. Each Bid shall be accompanied by Bid Security.

- B. The Bid Security shall be in the form of a Bid Bond, Certified check, or Cashier's check in an amount not less than five percent (5%) of the maximum value of the Bid, including any additive Alternates. NOTE: Checks other than Certified checks and Cashier's checks will not be accepted. Bonds shall be issued by a bonding company licensed to transact business in the State of Iowa. The Attorney in Fact who signs the Bond shall file with the Bond a certified and effectively dated copy of their Power of Attorney. The Bid Security shall be made payable to the Iowa Department of Administrative Services, and shall accompany the Bid. If a Bid Bond is not used, copies of Certified checks or Cashier's checks must be uploaded and hand delivered, in a sealed envelope, or mailed upon request. The Bid Security shall serve as a guarantee that a Bidder who is offered a contract will enter into an Agreement with the State of Iowa and will file an approved surety company's Performance Bond, Payment Bond and the Insurance Certificates as evidence of the required Insurance prior to execution of the contract. Upon failure to comply, the Bid Security shall be forfeited as liquidated damages. The governmental entity shall retain the bid security furnished by the successful bidder until the approved contract form has been fully executed, a bond has been filed by the bidder guaranteeing the performance of the contract, and the contract and bond have been approved by the governmental entity. The provisions of chapter 573, where applicable, apply to contracts awarded under this chapter. The governmental entity shall promptly return the checks or bidder's bonds of unsuccessful bidders to the bidders once the Notice of Intent to Award is issued.

3.06 DUE DATE AND TIME FOR RECEIPT OF BIDS

- A. Properly completed Bids shall be submitted online through [IMPACS Electronic Procurement System](#), no later than the time and date specified in the Notice to Bidder or any extension thereof made by Addendum. Written, emailed, oral or telephonic Bids are invalid, and will not receive consideration. The Bidder shall assume full responsibility for the timely online submission of the Bid. Late bids will not be accepted.

3.07 COMMENCEMENT AND COMPLETION DATES

- A. Commencement of the Work of the Contract shall be the day of receipt by the selected Contractor of the fully-executed contract. Final completion of the Work of the contract shall be acknowledged as a part of the Contractor's proposal.

3.08 SITE VISIT

- A. A site visit by the prospective bidder is highly recommended at the time of the Pre-Bid Meeting of this project.

3.09 PRE-BID MEETING

- A. Pre-Bid Meeting will be specified in the Notice to Bidders or any extension thereof made by Addendum.

3.010 QUESTIONS

- A. Questions on this project may be raised and discussed at the time of the Pre-Bid Meeting or by submitting in writing to the issuing officer as specified in the Notice to Bidders or any extension thereof made by Addendum.

3.011 ADDENDA AND INTERPRETATIONS OF THE CONTRACT DOCUMENTS

- A. Any person contemplating submitting a proposal for the proposed Contract, who is in doubt as to the true meaning of any part of the Bidding Documents, shall submit a written request for an interpretation thereof. The person submitting a request will be responsible for its prompt delivery. Every request for such interpretation should reference the Bid Number specified in the Bidding Documents, and shall be made in writing (email preferred). Questions shall be submitted to the

previously identified Purchasing Agent for the Department of Administrative Services. To be given consideration, requests shall be received as specified in the Notice to Bidders or any extension thereof made by Addendum. Replies, which revise or correct the Bidding Documents, or provide necessary clarifications, will be issued in the form of a written Addendum to the Bidding Documents. Interpretations, corrections or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections, or changes. The Bidder is to include any resultant cost changes in the Bid Sum. Addenda will be posted electronically at the respective bid site where the bid is initially posted. Acknowledgment by the Bidder of each issued Addendum shall be noted in the location so indicated on the Bid. All Addenda issued shall become part of the Contract Documents.

3.012 SUBSTITUTIONS

- A. Where the Bidding Documents stipulate a specific product be provided by naming one or more manufacturer and model, a substitute product will be considered when a written request is received as specified in the Notice to Bidders or any extension thereof made by Addendum prior to bid opening. Substitution requests will be considered for all products per Section 01 2500 Substitution Procedures, even if the specification does not include a statement such as “or equal,” “equal to,” “equivalent to,” or “basis of design,” unless otherwise noted. Substitution requests shall be emailed to the Issuing Officer at the email address provided in Instructions to Bidders Section 1.04.

3.013 OBLIGATION OF BIDDER

- A. It shall be the responsibility of each Bidder contemplating the submission of a Bid for the proposed Contract to fully acquaint himself/herself with conditions at the work site, project requirements, and to become acquainted thoroughly with the work, and all conditions that may be related to it. No considerations or revision in the contract price or scope of the project will be considered by the Owner for any item that could have been revealed by a thorough on-site inspection and examination.
- B. By submission of a Bid, it shall be understood that the Bidder assures that he/she has reviewed and is thoroughly familiar with the project requirements, contract conditions and supplementary conditions, the drawings, specifications, addenda, and that the bidder is aware of the conditions existing at the site that may relate to the work of this project. Failure of any Bidder to examine any form, document, or other instrument shall in no way relieve the Bidder from any obligation in respect to his/her Bid.

3.014 PUBLIC RECORDS AND REQUESTS FOR CONFIDENTIAL TREATMENT

- A. The Agency's release of public records is governed by Iowa Code chapter 22. Contractors are encouraged to familiarize themselves with Chapter 22 before submitting a Proposal. The Agency will copy and produce public records upon request as required to comply with Chapter 22 and will treat all information submitted by a Contractor as non-confidential records unless Contractor requests specific parts of the Proposal be treated as confidential at the time of the submission as set forth herein AND the information is confidential under Iowa or other applicable law.
- B. A Contractor requesting confidential treatment of specific information must: (1) fully complete Form 22 (Available at <https://das.iowa.gov/sites/default/files/procurement/pdf/Form%2022-ConfidentialityRequest-RFB.pdf>), (2) identify the request in the transmittal letter with the Contractor's Proposal, (3) conspicuously mark the outside of its Proposal as containing confidential information, (4) mark each page upon which confidential information appears, and (5) submit a “Public Copy” from which the confidential information has been excised.
- C. Form 22 will not be considered fully complete unless, for each confidentiality request, the Contractor: (1) enumerates the specific grounds in Iowa Code chapter 22 or other applicable law that supports treatment of the material as confidential, (2) justifies why the material should be maintained in confidence, (3) explains why disclosure of the material would not be in the best interest of the public, and (4) sets forth the name, address, telephone, and e-mail for the person

- authorized by Contractor to respond to inquiries by the Agency concerning the confidential status of such material.
- D. The Public Copy from which confidential information has been excised is in addition to the number of copies requested in Section 3 of this RFP. The confidential material must be excised in such a way as to allow the public to determine the general nature of the material removed and to retain as much of the Proposal as possible.
 - E. **Failure to request information be treated as confidential as specified herein shall relieve Agency and State personnel from any responsibility for maintaining the information in confidence. Contractors may not request confidential treatment with respect to pricing information and transmittal letters. A contractor's request for confidentiality that does not comply with this section or a contractor's request for confidentiality on information or material that cannot be held in confidence as set forth herein are grounds for rejecting contractor's Proposal as non-responsive. Requests to maintain an entire Proposal as confidential will be rejected as non-responsive.**
 - F. If Agency receives a request for information that Contractor has marked as confidential and if a judicial or administrative proceeding is initiated to compel the release of such material, Contractor shall, at its sole expense, appear in such action and defend its request for confidentiality. If Contractor fails to do so, Agency may release the information or material with or without providing advance notice to Contractor and with or without affording Contractor the opportunity to obtain an order restraining its release from a court possessing competent jurisdiction. Additionally, if Contractor fails to comply with the request process set forth herein, if Contractor's request for confidentiality is unreasonable, or if Contractor rescinds its request for confidential treatment, Agency may release such information or material with or without providing advance notice to Contractor and with or without affording Contractor the opportunity to obtain an order restraining its release from a court possessing competent jurisdiction.

3.015 WITHDRAWAL OF BID

- A. A Bid may be modified or withdrawn only before the time and date for receipt of Bids. Said request for modification or withdrawal of a bid must be completed online through [IMPACS Electronic Procurement System](#). A Bid shall remain valid for consideration by the Owner for the following period(s) of time after the date specified for receipt of Bids, or until such time following that period that the apparent low bidder requests in writing that the Bid be withdrawn, after which the Bid may be withdrawn without forfeiture of any required Bid Security. The Bid shall be valid for not less than thirty (30) calendar days after the date Bids are specified to be due. With the approval of the Department of Administrative Services, a bid may be withdrawn after opening, but only if the bidder provides prompt written notification that adequately documents the commission of an honest error that may cause undue financial loss.

3.016 BID OPENING

- A. All bids received on or before the due date and time specified in the Notice to Bidder or any extension thereof made by Addendum will be opened and the name of the Bidder and the amount of their Bid will be announced.

3.017 BASIS OF BIDS

- A. The Bidder shall include all additional documents or appendices that are requested to be submitted concurrent with the Bid submission; failure to comply may be cause for rejection.
- B. In accordance with Iowa law, Section 8A.311: A bidder, to be considered for an award of a state construction contract, shall disclose to the state agency awarding the contract the names of all subcontractors and suppliers who will work on the project being bid, within forty-eight (48) hours after the published date and time by which bids must be submitted. A bidder shall not replace a subcontractor or supplier disclosed without the approval of the state agency awarding the contract.
 - 1. A bidder, prior to an award or who is awarded a state construction contract, shall disclose all of the following, as applicable:

- a. If a subcontractor or supplier disclosed (under the preceding) by a bidder is replaced, the reason for replacement and the name of the new subcontractor or supplier;
 - b. If the cost of work to be done by a subcontractor or supplier is changed or if the replacement of a subcontractor or supplier results in a change in the cost, the amount of the change in cost.
 - c. Any reduction in subcontractor or supplier price as a result of the change, if the change is approved by the Owner, shall be deducted from the Trade Contract via a deductive Change Order. Any such changes, if approved by the Owner, which result in an increase in the Trade Contract Price shall be borne by the Trade Contractor.
- C. The Bidder is specifically advised that any person, firm or other party to whom it is proposed to award a subcontract under this contract must:
 - 1. Be registered in the State of Iowa and have an Iowa Contractor's Registration number, and
 - 2. Be acceptable to the Owner.

3.018 INFORMALITIES/ REJECTION OF BIDS

- A. The Iowa Department of Administrative Services reserves the right to waive any irregularities or informalities and to enter into a Contract with a Bidder, or to reject any or all bids as it deems to be in the best interest of the State, without penalty.

3.019 CONSIDERATION OF BIDS

- A. It is the intent of the Department of Administrative Services to award a Contract to the lowest responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and is determined to be compliant with all Bidding Requirements, and does not exceed the funds available for construction.
- B. Bidder is to bid on each Alternate Bid requested. Failure to do so may result in disqualification of the bid. The Department of Administrative Services reserves the right to accept any, or no, Alternate Bid. Alternate Bids may be considered in any order or combination, and the low successful Bidder will be determined on the basis of the sum of the Base Bid and the Alternate(s) accepted at the time of the Contract award.
- C. In evaluating Bids, any proposal offered by a Bidder for an alternate design, or for materials other than those shown or specified for the Base Bid or for Alternate Bid construction under the proposed Construction Documents or called for by any issued Addenda to those Construction Documents, will not be considered in determining the low successful Bidder. However, the Department of Administrative Services reserves the right to consider any such Bidder-proposed (Contractor's Alternate) alternate designs or materials with the low successful Bidder, after the low successful Bidder is determined in the manner described above (A and B).
- D. Notice of Intent to Award the Bid(s) will be sent to all Respondents submitting a timely Bid and may be posted at the website shown on the RFB cover sheet. Negotiation and execution of the Contract(s) shall be completed no later than fifteen (15) days from the date of the Notice of Intent to Award or such other time as designated by Agency. If the successful Bidder fails to negotiate and deliver an executed Contract, including all required documents such as payment and performance bonds and insurance certificate, by that date, the Agency, in its sole discretion, may cancel the award and award the Contract to the remaining Bidder the Agency believes will provide the best value to the State.

3.020 PREFERENCE

- A. By virtue of statutory authority, a preference shall be given to Iowa domestic labor, products produced and provisions grown within the state of Iowa, in accordance with the provisions of Chapter 73, Code of Iowa and any amendments thereto.
- B. Enforcement of reciprocal resident bidder preference and resident labor force preference codified at Iowa Code Section 73A.21.
 - 1. NOTICE: Failure on the part of the bidder to carefully read the following paragraphs and to provide the information requested below may make the bidder's bid materially nonresponsive

and therefore ineligible for contract award. Violations of Iowa Code Section 73A.21 may, among other things, result in civil penalties assessed by the Commissioner of the Division of Labor of Iowa Workforce Development. The bidder should seek out the advice of an attorney if he or she has questions about Iowa Code Section 73A.21. As a part of the competitive procurement of contracts for Public Improvements that must be awarded to the low bidder (if the bid is responsive and the bidder is deemed responsible), Public Bodies shall allow a preference to Resident Bidders if a Nonresident Bidder places a bid for the contract for the Public Improvement and that Nonresident Bidder's state or foreign country gives resident bidders of that state or foreign country a preference (including a labor force preference or any type of preferential treatment). The preference allowed, or reciprocally applied, shall be equal to the preference given or required by the state or foreign country in which the Nonresident Bidder is a resident bidder.

"Public Body" means the State of Iowa (and its agencies) and any of its political subdivisions, including school districts, public utilities, and the state board of regents.

"Public Improvement" means a building or other construction work to be paid for in whole or in part by the use of funds of the State of Iowa, its agencies, and any of its political subdivisions and includes road construction, reconstruction, and maintenance projects.

"Resident Bidder" means a person or entity authorized to transact business in of the State of Iowa and having a place of business for transacting business within the State of Iowa at which it is conducting and has conducted business for at least three years prior to the date of the first advertisement for the public improvement. Note, however, that if a nonresident bidder's state or foreign country has a more stringent definition of a resident bidder, the more stringent definition is applicable as to bidders from that state or foreign country.

"Nonresident Bidder" means a person or entity who does not meet the definition of a resident bidder.

- C. Nonresident bidders shall be required to certify on the Bid submission, where so indicated, the state or foreign country in which the firm is a resident, and if that state or foreign country uses a percentage for in-state bidders and the amount of the preference.
- D. If it is determined that this may cause denial of federal funds which would otherwise be available, or would otherwise be inconsistent with requirements of federal law, this section shall be suspended, but only to the extent necessary to prevent denial of the funds or to eliminate the inconsistency with federal requirements.

3.021 QUALIFICATIONS

- A. In accordance with Iowa Code 26.9(2) and 26.16, no potential bidder shall be required to provide confidential or proprietary information or meet any class requirements as a precondition to submitting a responsive bid. However, as noted in Iowa Code 26.9(2), the lowest responsive bidder may be required to provide additional information to verify responsibility prior to and as a condition of obtaining final award of the contract. Any qualification requirements contained in any bid document indicates only preferred qualifications, not a precondition to bid, and the lowest responsive bidder's qualifications will be evaluated individually based on all information provided.
- B. The Owner may make such investigations as he or she deems necessary to determine the ability of the awarded Bidder to perform the required work, and the awarded Bidder shall furnish to the Owner all such information and data for this purpose. The Owner reserves the right to rescind any awarded Bid if the evidence submitted by, or in investigation of, such Bidder fails to satisfy the Owner that the Bidder is properly qualified to carry-out the obligations of the Contract and to complete the Work contemplated therein.
- C. Bidders shall be registered as a Construction Contractor with the Labor Commissioner, Iowa Workforce Development Department, as required by Chapter 91C of the Code of Iowa. Bidder's Iowa Contractor Registration Number shall be included in the location provided in the Bid Form.
- D. Non-resident corporations submitting bids must be in compliance with Section 490.1501 of the Code of Iowa and legally authorized thereby to carry-on such business in the State of Iowa as is required by the Contract Documents.
- E. An out-of-state Bidder, if awarded a contract, will be required to submit evidence of authorization to do business in the State of Iowa.

3.022 INSURANCE

- A. Insurance Requirements
 - 1. The Contractor shall maintain in effect, with insurance companies of recognized responsibility, at its expense, insurance covering its work of the type and in amounts required by this Contract. The Contractor's insurance shall, among other things, insure against any loss or damage resulting from the Contractor's performance of this Contract. All such insurance policies shall remain in full force and effect for the entire life of this Contract and shall not be canceled or changed except after thirty (30) days written notice to the Owner.
 - 2. **Amounts of Insurance Required – Refer to ConsensusDOCS 802 (see template in Project Manual)**
- B. Certificates of Coverage
 - 1. Certificates of the insurance described above shall be submitted to the Owner before starting any construction activities and shall be subject to approval by the Owner. The Contractor shall provide certificates for the insurance required. The insurer shall state in the certificate that no cancellation of the insurance will be made without at least thirty (30) days prior written notice to the Contractor. Upon receipt of any notice of cancellation or alteration, Contractor shall within ten (10) days procure other policies of insurance, similar in all respects to the policy or policies, about to be canceled or altered, and, if the Contractor fails to provide, procure, and deliver acceptable policies of insurance, or satisfactory evidence thereof, in accordance with the terms hereof then, at the Owner's option, Owner may obtain such insurance at the cost and expense of Contractor, without the need of any notice to Contractor.
- C. No Limitation of Liability
 - 1. Acceptance of the insurance certificates by the Owner shall not act to relieve the Contractor of any obligation under this Contract. All insurance policies and certificates shall be issued only by companies authorized to transact business in the State of Iowa. It shall be the responsibility of the Contractor to keep the respective insurance policies and coverage's current and in force during the life of this agreement.
 - 2. A Sample Certificate of Insurance is attached for reference following this Section.

3.023 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

- A. The Agreement for the Work will be written on ConsensusDOCS 802 Form of Agreement between Owner and Contractor (sample of the document with modifications incorporated is bound in this Project Manual).

3.024 EXECUTION OF CONTRACT

- A. Contract documents shall mean and include the following:
 - 1. Contract: ConsensusDOCS 802
 - 2. Performance and Payment Bonds
 - 3. Project Manual
 - 4. Drawings
 - 5. Numbered Addenda issued after initial publication of Bid Documents
 - 6. Numbered Modifications (Change Orders) issued after Contract is signed

3.025 LAWS AND REGULATIONS

- A. The Bidder's attention is directed to the fact that all applicable laws and regulations of Federal and State agencies having jurisdiction over the construction of this project shall apply to any contract resulting from this proposal, and it shall be deemed that those rules and regulations are made a part of such contract the same as if set forth in their entirety therein. By submitting a Bid, the Bidder confirms that he/she is familiar with and understands the Contractor's responsibility under all Federal and State of Iowa laws and regulations with respect to the Work described by the proposed Contract Documents.

3.026 CONTRACT DOCUMENTS AND ORDER OF PRECEDENCE

- A. Where an irreconcilable conflict exists among Applicable Legal Requirements, this Contract, the specifications in the Materials and the Drawings, the earliest item mentioned in this sentence involving a conflict shall control over any later mentioned item or items subject to such conflict unless doing so would result in reducing the Bidder's duty of care or obligations under this Contract, in which case the terms resulting in the highest requirements for Bidder performance shall control.

3.027 CONDITIONS OF THE WORK

- A. Each bidder must fully inform him/herself of the conditions under which the work is to be performed at the site of the work, the obstacles which may be encountered, and all other relevant matters concerning the work to be performed. Failure to do so will not relieve a successful bidder of the obligation to furnish all material and labor necessary to carry out the provisions of the contract. When a site visit is required by provisions located elsewhere in these Instructions to Bidders, as a site tour in conjunction with a mandatory Pre-Bid Meeting, it shall be the Bidder's responsibility to fulfill this obligation as a condition of bidding the Work described in the Bidding Documents.
- B. No allowance will be made for any additional compensation by reason of any matter or condition with which the bidder might have fully informed him/herself, but failed to do so prior to bidding. Insofar as possible, the Contractor and all subcontractors shall employ such methods or means in carrying out the work so as not to cause any interruption of, or interference with, the work of any other subcontractor or trade.

3.028 SUBCONTRACTS

- A. The Prime Contractor shall be responsible for notifying all subcontractors and suppliers and informing them that they are bound in each case by all applicable provisions of the bidding information and those of the proposed Form of Agreements as defined in the Contract Documents.

END OF SECTION

SECTION 00 2113.01

IMPACS Public Construction Bidders User Guide

Public construction bids must be submitted on-line at [IMPACS Electronic Procurement System](#).

Bidders must be registered in IMPACS to submit a Bid.

To create an account, enter your email address and click on "Next" and click "Create Account". Bidder must enter all fields noted with * including legal company name, contact first and last name, phone number, confirm email address, password, re-enter password, select account recovery question including answer, confirm answer, select box accepting websites use terms and conditions and select security check box "I'm not a robot".

On the [IMPACS Electronic Procurement System](#) Customer Portal Home page, Bidder selects "View Event" in the Sourcing Events section.

Sourcing Events ?				
Show	Opening or Closing Soon ▼		Go to Public Opportunities	
Event Number	Status	Event Title	Dates	Action
RFB923700-02	Open	Hoover East Side Pavers	Open: 4/27/2022 12:00:00 PM CDT Close: 5/5/2022 12:00:00 PM CDT	View Event ▼

Bidders can view event details including description, prerequisites, buyer attachments, questions and answers.

To submit a Bid, Bidder must select "**Yes, I intend to Bid**". Bidder must complete the following sections.

Prerequisites - Bidder must complete all prerequisites.

- Bidder must upload a file of the Bid Security/Bond for 5% of total Bid Amount and certify that if they are awarded the construction contract they will enter into the contract at the Bid Amount submitted.
- Bidder must upload the completed and signed Bid Form.
NOTE: Bids are to be entered on the Bid Form only; not in the IMPACS. As a result, IMPACS will display a bid amount of \$0.

Questions - Bidder must complete all questions.

Review & Submit - Bidder must select the certification box certifying that the statements and information in response are true and correct to the best of their knowledge and belief.



SAMPLE

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)
xx/xx/xxxx

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Agent's Name Agent's Address	CONTACT NAME: Agent's Information	
	PHONE (A/C, No, Ext):	FAX (A/C, No):
INSURED Trade Contractor's Name Trade Contractor's Mailing Address	E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	
	INSURER A:	NAIC #
	INSURER B:	Carriers
	INSURER C:	
	INSURER D:	
	INSURER E:	
INSURER F:		

COVERAGES

CERTIFICATE NUMBER:

REVISION NUMBER:

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

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	Minimum
* A	COMMERCIAL GENERAL LIABILITY	X	X	#TBD- CGL	3/1/17	3/1/18	EACH OCCURRENCE	\$ 1,000,000
	CLAIMS-MADE ☒ OCCUR		DAMAGE TO RENTED PREMISES (Ea occurrence)				\$	
			MED EXP (Any one person)				\$	
			PERSONAL & ADV INJURY				\$ 1,000,000	
			GENERAL AGGREGATE				\$ 2,000,000	
	GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS - COMP/OP AGG	\$ 1,000,000
	POLICY ☒ PRO-JECT ☐ LOC							\$
	OTHER:							\$
B	AUTOMOBILE LIABILITY	X	X	#TBD-AL	3/1/17	3/1/18	COMBINED SINGLE LIMIT (Ea accident)	\$ 1,000,000
	☒ ANY AUTO		BODILY INJURY (Per person)				\$	
	ALL OWNED AUTOS	SCHEDULED AUTOS	BODILY INJURY (Per accident)				\$	
	HIRED AUTOS	NON-OWNED AUTOS	PROPERTY DAMAGE (Per accident)				\$	
							\$	
C	UMBRELLA LIAB ☒ EXCESS LIAB	X	X	#TBD-UMB	3/1/17	3/1/18	EACH OCCURRENCE	\$ 10,000,000
		CLAIMS-MADE					AGGREGATE	\$
	DED	RETENTION \$						\$
D	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY			#TBD-WC	3/1/17	3/1/18	☒ PER STATUTE ☐ OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH)	Y/N ☐ N/A	X				E.L. EACH ACCIDENT	\$ 500,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	\$ 500,000
							E.L. DISEASE - POLICY LIMIT	\$ 500,000
* E	Owners Contrators Protective Liability			#TBD-OCF	3/1/17	3/1/18	*Limits equal to CGL (or) as required by owner (Note- Would be either CGL or OCF, not both)	

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Additional Insured on a Primary & Non-Contributory basis (CGL;AL;UMB/Excess) in favor of : (Owner) Iowa Department of Administrative Services (DAS), Officers, Directors, Members, Consultants, Agents, and Employees.

Waiver of Subrogation (CGL;AL;WC/EL;UMB/Excess) in favor of: (Owner) Iowa Department of Administrative Services (DAS), Officers, Directors, Members, Consultants, Agents, and Employees.

Project 9362.00 (Number varies by project)

CERTIFICATE HOLDER

Iowa Department of Administrative Services (DAS)
109 SE 13th Street
Des Moines, IA 50319

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Signature

SECTION 00 3113

PRELIMINARY SCHEDULE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Preliminary Construction Schedule
- B. Schedule Durations

1.02 PRELIMINARY SCHEDULE

- A. A preliminary schedule has been identified by the Owner for the implementation of the Project. Refer to the schedule following this Section for references to anticipated milestones and construction duration.
- B. Each step of the Preliminary Schedule is subject to receipt of acceptable bids, Owner's decision process and date of commencement.
- C. A proposed construction schedule shall be submitted by all Trade Contractors to the Construction Manager no later than 48 hours prior to the pre-construction meeting. A revised Construction Schedule will be submitted by the Construction Manager once all preliminary schedules are reviewed and approved by the Owner.
- D. The final construction schedule will be established post award of bids with the cooperation of all contractors.

1.03 SCHEDULE DURATIONS

- A. Anticipated Notice of Intent to Award – 3/02/2024
- B. Anticipated Date of Commencement – 03/15/2024
- C. Substantial Completion by – 6/17/2024

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

9362.00 CBC District 2 Geothermal System Replacement					DCI - Print												08-Feb-24 10:28 PM													
#	Activity Name	Remaining Duration	Start	Finish	February 2024				March 2024				April 2024				May 2024				June 2024				July 2024				just 2024	
					04	11	18	25	03	10	17	24	31	07	14	21	28	05	12	19	26	02	09	16	23	30	07	14	21	28
1	9362.00 CBC District 2 Geothermal System Replacement																													
2	Milestones																													
3	Preconstruction																													
4	Consultant Selection																													
5	Environmental Consultant																													
6	Design Consulnat																													
7	Geotechnical Consultant																													
8	Commissioning Consultant																													
9	Hazardous Materials Consultant																													
10	Special Inspections Consultant																													
11	Site Selection																													
12	Design																													
13	Utility Providers																													
14	Bid Letting																													
15	Issue RFB to Procurement (State)	1	08-Feb-24	08-Feb-24 0																										
16	Post RFB to TSB (State), MBI, Planrooms	2	09-Feb-24	10-Feb-24 0																										
17	RFB Procurement	15	12-Feb-24	01-Mar-24 0																										
18	RFB Pre-bid Meeting	0	20-Feb-24																											
19	RFB Questions Due	0		23-Feb-24 0																										
20	RFB Final Addendum	0		28-Feb-24 0																										
21	Bids Due	0		01-Mar-24 0																										
22	Contractor NOIs	0	04-Mar-24																											
23	Contractor 5 Day Appeal Period	5	04-Mar-24	08-Mar-24 0																										
24	Contractor Contract Execution	10	04-Mar-24	15-Mar-24 0																										
25	Construction																													
26	Administrative																													
27	Bid Package Scope Review (Each Prime)	5	11-Mar-24	15-Mar-24 0																										
28	Construction Kick-Off Meeting	1	18-Mar-24	18-Mar-24 0																										
29	DNR Notification of Demolition & Renovati	5	25-Mar-24	01-Apr-24 0																										
30	Procurement																													
31	Pumps Submittal Development	10	18-Mar-24	29-Mar-24 0																										
32	Contractor Site Specific Safety Plans Subr	15	18-Mar-24	05-Apr-24 0																										
33	Controls Submittal Development	15	18-Mar-24	05-Apr-24 0																										
34	Geothermal Vault Submittal Deveopment	5	18-Mar-24	22-Mar-24 0																										
35	VFD Submittal Development	10	18-Mar-24	29-Mar-24 0																										
36	Piping Submittal Development	5	18-Mar-24	22-Mar-24 0																										
37	Geothermal Vault Submittal Review	10	25-Mar-24	05-Apr-24 0																										
38	Piping Submittal Review	5	25-Mar-24	29-Mar-24 0																										
39	Pumps Submittal Review	10	01-Apr-24	12-Apr-24 0																										
40	VFD Submittal Review	10	01-Apr-24	12-Apr-24 0																										
41	Piping Submittal Ordered	5	01-Apr-24	05-Apr-24 0																										
42	Controls Submittal Review	5	08-Apr-24	12-Apr-24 0																										
43	Geothermal Vault Ordered	5	08-Apr-24	12-Apr-24 0																										
44	Piping Submittal Delivery	10	08-Apr-24	19-Apr-24 0																										
45	Pumps Ordered	5	15-Apr-24	19-Apr-24 0																										
46	Controls Review Meeting	1	15-Apr-24	15-Apr-24 0																										
47	Geothermal Vault Delivery	15	15-Apr-24	03-May-24 0																										

Actual Work

Remaining Work

Critical Remaining Work

Milestone

Page 1 of 2

TASK filter: Hide Done Activities.

© Oracle Corporation

9362.00 CBC District 2 Geothermal System Replacement					DCI - Print																	08-Feb-24 10:28 PM												
#	Activity Name	Remaining Duration	Start	Finish	February 2024				March 2024				April 2024				May 2024				June 2024				July 2024				August 2024					
					01	04	11	18	25	03	10	17	24	31	07	14	21	28	05	12	19	26	02	09	16	23	30	07	14	21	28	04		
48	VFD Submittal Ordered	5	15-Apr-24	19-Apr-24																														
49	Controls Ordered	5	16-Apr-24	22-Apr-24																														
50	Pumps Delivery	20	22-Apr-24	17-May-24																														
51	VFD Submittal Delivery	20	22-Apr-24	17-May-24																														
52	Controls Delivery	20	23-Apr-24	20-May-24																														
53	Site Development																																	
54	Mobilization	5	01-Apr-24	05-Apr-24																														
55	Joint Locate Meeting	1	08-Apr-24	08-Apr-24																														
56	Site Removals	2	09-Apr-24	10-Apr-24																														
57	Geothermal Well Boring	15	11-Apr-24	01-May-24																														
58	Freezer & Cooler Temporary Connection	2	02-May-24	03-May-24																														
59	Geothermal Vault Installation	2	02-May-24	03-May-24																														
60	Supply and Return Lines from Vault to Building	5	06-May-24	10-May-24																														
61	Demolition of Interior MEP	2	20-May-24	21-May-24																														
62	New MEP Installations	7	22-May-24	31-May-24																														
63	Controls Installation	5	03-Jun-24	07-Jun-24																														
64	Electrial Connections	3	05-Jun-24	07-Jun-24																														
65	Start-Up	1	10-Jun-24	10-Jun-24																														
66	Commissioning	5	11-Jun-24	17-Jun-24																														
67	Insulation	1	18-Jun-24	18-Jun-24																														
68	Foundations and Structure																																	
69	Interior																																	
70	Closeout																																	
71	O&M & Attic Stock Procurement	15	21-May-24	11-Jun-24																														
72	Final Inspection	0		18-Jun-24																														
73	Intial Construction Clean	1	19-Jun-24	19-Jun-24																														
74	Owner & Design Team Punch List	1	20-Jun-24	20-Jun-24																														
75	Owner Training	5	21-Jun-24	27-Jun-24																														
76	Owner & Design Team Punch List Corrections	5	21-Jun-24	27-Jun-24																														
77	Owner Closeout Conference	0		27-Jun-24																														
78	Final Clean	1	28-Jun-24	28-Jun-24																														
79	Owner Occupancy	0		28-Jun-24																														

SECTION 00 3143

PERMIT APPLICATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Permit Application Information
- B. Licenses, Permits, and Related Inspections

1.02 PERMIT APPLICATION INFORMATION

- A. State Building Code Plan Review: The plan review and inspections for this project have been applied for by the Architect. Please contact your inspector prior to construction and occupancy.
- B. Electrical Permit and Inspections: Trade Contractor is responsible for permits and inspections.
- C. Other Applicable inspections: Trade Contractor is responsible for any other applicable project specific permits and inspections.

1.03 LICENSES, PERMITS, AND RELATED INSPECTIONS

- A. The Bidder shall comply with all codes, laws, ordinances, rules and regulations of any public authority having jurisdiction that bears on the performance of its work. All construction, materials and methods shall comply with the State Building Codes, except where plans and specifications establish a higher standard.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 00 4116

BID FORM

The Bid Form must be submitted online through the State's [IMPACS Electronic Procurement System](#).

RFB #936200-01

BID FORM for CONSTRUCTION CONTRACT
for
Community Based Corrections Facility
1401 South 17th Ave, Marshalltown, Iowa 50158
Project 9362.00

Iowa Department of Administrative Services
Hoover State Office Building, Level 3
1305 East Walnut Street
Des Moines, Iowa 50319-0105

The following information is to be completed and submitted with your bid..

1. Bid Form - Completed and Signed (to be uploaded with bid submission)
2. Non Discrimination Clause Information
3. Contractor Targeted Small Business Enterprise Pre-Bid Contract Information
4. Bid Security – 5% of total Bid amount (to be uploaded with bid submission)

Authorized Representative:

The undersigned Bidder, in response to your Request for Bid for construction of the above project, having examined the Drawings, Specifications, and other Bidding Documents dated February 09, 2024, and Addenda issued and acknowledged below as received and being familiar with all the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, equipment and supplies to perform all work to construct the project in strict accordance with the proposed Contract Documents, within the time and at the prices stated below. Prices are to cover all expenses incurred in performing the work required under the proposed Contract Documents, of which this bid is a part.

Bidder acknowledges receipt of the following Addenda which are a part of the Bidding Documents and for which any effect on cost of the Work is included in the bid amounts indicated:

Number	_____	_____	_____	_____	_____
Dated	_____	_____	_____	_____	_____

Note that the State of Iowa is exempt from State and Local sales and use taxes (including local option and school option) for this project. Taxes on construction materials shall NOT be included in the bid amounts.

Amounts shall be indicated in both words and figures. In case of discrepancy, the amount indicated in words shall govern.

BID PACKAGES:

BP 01

Description: Geothermal Systems

Bidder proposes and agrees to perform all work as described in the Construction Documents for the sum of:

(\$ _____). Dollars

BP 02

Description: Electrical

Bidder proposes and agrees to perform all work as described in the Construction Documents for the sum of:

(\$ _____). Dollars

Bidder hereby certifies that:

1. This bid is genuine and is not made in the interest of or on behalf of any undisclosed person, firm or corporation;
2. Bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid; Bidder has not solicited or induced any person, firm or corporation to refrain from bidding; and Bidder has not sought by collusion to obtain any advantage over any other bidder or over the Owner.
3. Bidder hereby certifies that the Bidder is registered with the Iowa Labor Commissioner as a Contractor as required by Chapter 91C, Code of Iowa.
4. Bidder agrees to comply with all Federal and State Affirmative Action/Equal Employment Opportunity requirements concerning fair employment and will not discriminate between or among them by reason of race, color, religion, sex, national origin or physical handicap.
5. All construction under this Contract shall conform to the requirements of the *Iowa State Building Code*.
6. Bidder agrees that this bid shall remain valid and shall not be withdrawn for a period of thirty (30) calendar days after the date for receipt of bids.
7. Bidder agrees that if written notice of acceptance of this bid is mailed, emailed, or delivered to the undersigned within thirty (30) days after the date in which bids are due, or at any time thereafter before it is withdrawn, the undersigned will sign and return the Contract Agreement, prepared in accord with the Bidding Documents and this bid as accepted; and will also provide proof of insurance coverage and required surety bonds.
8. Bidder understands that the Owner reserves the right to reject any and all bids, and to waive irregularities or informalities and enter into a contract for the work, as the Owner deems to be in the best interest of the State.

9. Bidder understands that the Owner reserves the right to accept any, or no, Alternate Bid, if requested, and that the Alternate Bids may be considered in any order or combination, and the low Bidder shall be determined on the basis of the sum of the base bid and any Alternate(s) accepted.

Subcontractors:

The Trade Contractor must identify all Subcontractors and Suppliers within 48 hours of the published date and time for which bids must be submitted, in accordance with Iowa Code Section 8A311, as amended by House File 646 in 2011. Subcontractors and suppliers may not be changed without the approval of the Owner. Requests for changing a Subcontractor or supplier must identify the reason for the proposed change, the name of the new Subcontractor or supplier, and the change in the subcontractor or supplier price as a result of the change. Any reduction in subcontractor or supplier price as a result of the change, if the change is approved by the Owner, shall be deducted from the Trade Contract Price via a deductive Change Order. Any such changes, if approved by the Owner, which result in an increase in the Trade Contract Price shall be borne by the Trade Contractor.

Enforcement of Reciprocal Resident Bidder Preference, per Iowa Code 73A.21.

All bidders shall either check the box next to "Resident Bidder" or check the box next to "Nonresident Bidder" and by doing so and signing thereafter certifies and attests to the same. All information requested must be provided. Seek out the advice of an attorney if you have questions.

"Resident Bidder" means a person or entity authorized to transact business in of the State of Iowa and having a place of business for transacting business within the State of Iowa at which it is conducting and has conducted business for at least three years prior to the date of the first advertisement for the public improvement. Note, however, that if a nonresident bidder's state or foreign country has a more stringent definition of a resident bidder, the more stringent definition is applicable as to bidders from that state or foreign country.

☐

Resident Bidder

Name of Resident Bidder: _____

By: _____
Authorized Agent and Signatory of Resident Bidder

OR:

☐

Nonresident Bidder

Name of Nonresident Bidder: _____

Name of State or Foreign Country of Nonresident Bidder: _____

Particularly identify and describe any preference, labor preference, or any other type of preferential treatment, in effect in the nonresident bidder's state or foreign country at the time of this bid:

NOTICE: Nonresident Bidders domiciled in a state or country with a resident labor force preference shall make and keep, for a period of not less than three years, accurate records of all workers employed on the public improvement. The records shall include each worker's name, address, telephone number when

available, social security number, trade classification, and the starting ending time of employment.

By: _____
Authorized Agent and Signatory of Nonresident Bidder

Bid Form shall be signed by an officer of the company with authority to bind in a contract.
Notice of acceptance of this bid, or request for additional information by the Department of Administrative Services, may be addressed to the undersigned at the address set forth below:

Legal Name of Firm: _____

Date: _____

Signature of Bidder: _____

Title: _____

Typed Name of Signatory: _____

Email: _____

Business Address:

Telephone Number: _____ Fax Number: _____

Federal Tax Identification Number: _____

Iowa Contractor Registration Number: _____

Bidder Safety Manager Name: _____

For an out-of-state Bidder, Bidder certifies that the Resident Preference given by the State or

Foreign Country of Bidder's residence, _____, is _____ %.

END OF SECTION

SECTION 00 4116.01

NON-DISCRIMINATION CLAUSE

This Section is for informational purposes only. All information will be submitted online through the State's [IMPACS Electronic Procurement System](#).

PART 1 - GENERAL

All contractors, subcontractors, vendors and suppliers of goods and services doing business with the State of Iowa and value of said business equals or exceeds \$10,000 annually, agree as stated below.

1.01 NONDISCRIMINATION CLAUSE

- A. The contractor, subcontractor, vendor and supplier of goods and services will not discriminate against an employee or applicant for employment because of race, creed, color, sex, national origin, ancestry, religion, economic status, age, disability, political opinion, or affiliations of an applicant or employee based upon the nature of the job occupation. The contractor, subcontractor, vendor and supplier will develop an Affirmative Action Program to insure that applicants are employed and that employees are treated during employment without regard to their race, creed, color, sex, national origin, ancestry, religion, economic status, age, disability, political opinions or affiliations. Such action shall include, but not be limited to the following:
 - 1. Employment.
 - 2. Upgrading.
 - 3. Demotion or transfer.
 - 4. Recruitment and advertising.
 - 5. Layoff or termination.
 - 6. Rates of pay or other forms of compensation.
 - 7. Selection for training, including apprenticeship.
- B. The contractor, subcontractor, vendor and supplier of goods and services will, in all solicitations or advertisements for employees, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, sex, national origin, ancestry, religion, economic status, age, disability, political opinion or affiliations.
- C. The contractor, subcontractor, vendor and supplier or their collective bargaining representative will send to each labor union or representative or workers with which they have a collective bargaining agreement or other contract or understanding, a notice advising the said labor union or workers' representative of the contractor's commitments under this section.
- D. The contractor, subcontractor, vendor and supplier of goods and services will comply with all published rules, regulations, directives and orders of the State of Iowa Affirmative Action Program Contract Compliance Provisions.
- E. The contractor, subcontractor, vendor and supplier of goods and services will furnish and file compliance reports within such time and upon such forms as provided by the Equal Employment Opportunity Officer, said forms may elicit information as to the policies, procedures, patterns, and practices of each subcontractor as state as the contractor themselves and said contractor, subcontractor, vendor and supplier will permit access to their employment books, records and accounts to the State's Equal Employment Opportunity Officer, for the purpose of investigation to ascertain compliance with this Contract and with rules regulations of the State's Affirmative Action Program.
- F. In the event of the contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of such rules, regulations and orders; this Contract may be canceled, terminated or suspended in whole or in part and the Contractor may be declared ineligible for further contracts in accordance with procedures authorized by the State of Iowa.

- G. The contractor, subcontractor, vendor and supplier of goods and services will include, or incorporate by reference, the provisions of the nondiscrimination clause in every contract, subcontract or purchase order unless exempted by the rules, regulations or orders of the State's Affirmative Action Program, and will provide in every subcontract or purchase order that said provisions will be binding upon each contractor, subcontractor or seller.
- H. The parties agree to comply with "Compliance with the Law; Nondiscrimination in Employment" of the current Terms and Conditions at the award of this contract. Current Terms and Conditions may be found on the following web site and are, by this reference, made a part of this Agreement. <https://das.iowa.gov/procurement/terms-and-conditions>
- I. We certify and recognize that we are morally and legally committed to nondiscrimination in employment. Any person who applies for employment with our company will not be discriminated against because of race, creed, color, sex, national origin, ancestry, religion, economic status, age or disabilities, unless disabilities are based upon the nature of the job occupation.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 00 4116.02

TARGETED SMALL BUSINESS INFORMATION

This Section is for informational purposes only. All information will be submitted online through the State's [IMPACS Electronic Procurement System](#).

PART 1 - GENERAL

1.01 TARGETED SMALL BUSINESS INFORMATION

- A. Subcontractor Targeted Small Business Enterprise Pre-Bid Contact Information, including subcontractor and dollar amount to be subcontracted, is to accompany the Bid submission. Bidders shall comply with all affirmative action/equal opportunity provisions of State and Federal laws. The Owner seeks to provide opportunities for Targeted Small Businesses in accordance with the provisions of Chapter 73 of the Code of Iowa.
- B. [Search the Targeted Small Business Directory](#) for certified State of Iowa Targeted Small Businesses.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

CONTRACTOR	BID NO.	PAGE #	

You are requested to provide the information on this form showing your targeted Small Business enterprises contracts made prior to your bid submission. This information is subject to verification and confirmation. NOTE: The Department of General Services will not regard your acceptance or use of a low quote or bid from a non-targeted Small Business Enterprise on any subcontract item as evidence itself of any lack of good faith effort to solicit targeted Small Business Enterprise subcontractors on this project. However, every effort shall be made to solicit quotes or bids on as many subcontractable items as necessary to evidence affirmative action in contracting.

[illegible]

00 4116.02 - 2

SECTION 00 4313

BID SECURITY FORMS

PART 1 - GENERAL

1.01 BID SECURITY FORMS

- A. A Bid Bond form will be required on this project. An amended ConsensusDocs 262 is attached for reference following this page. ConsensusDocs bid bond form is not required (other standard forms are acceptable to the State of Iowa).

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION



CONSENSUSDOCS 262 **BID BOND** **(AMENDED BY STATE OF IOWA)**

This document was developed through a collaborative effort of organizations representing a wide cross-section of the design and construction industry. The organizations endorsing this document believe it represents a fair allocation of risk and responsibilities for all project participants.

Endorsing organizations recognize that this document must be reviewed and adapted to meet specific needs and applicable laws. This document has important legal and insurance consequences. You are encouraged to consult legal, insurance and surety advisors before completing or modifying this document. The software includes a notes section indicating where information is to be inserted to complete this document. Further information and endorsing organizations' perspectives are available at www.consensusdocs.org/guidebook.

For Use with ConsensusDOCS 200, Standard Form of Agreement and General Conditions Between Owner and Constructor (Where the Contract Price is a Lump Sum) and ConsensusDOCS 500, Standard Agreement and General Conditions Between Owner and Construction Manager.

The Trade Contractor, _____ (the "Trade Contractor") has submitted a Bid to the Owner, _____, (the "Owner") for the _____ (the "Project") in accordance with the Bidding Documents, including Drawings and Specifications prepared by _____ (the "Design Professional").

By virtue of this Bid Bond (the "Bond"), the Constructor as Principal and _____ as Surety ("Surety"), are bound to the Owner as Obligor in the maximum amount _____, Dollars (\$_____) (the "Bond Sum"). The Constructor and Surety hereby bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein.

1. If the Obligor shall accept the bid of the Constructor, the Constructor shall enter into an Agreement with the Obligor in accordance with the terms of such Bid.
2. Constructor shall procure such bond or bonds as are specified in the Contract Documents for the faithful performance of the Work and for the prompt payment of labor and materials furnished in the performance of the Work.
3. If the Constructor fails to enter such Agreement and give such bonds, the Constructor shall pay to the Obligor the difference between the amount of Constructor's bid and the amount of such agreement the Obligor in good faith executes with another Party to perform the Work covered by Constructor's Bid, not to exceed the Bond Sum stated above.
4. If the Constructor shall fulfill its obligation under Articles 1 through 3, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

This Bond is entered into as of _____ (date)

SURETY: _____ (seal)

BY:

Print Name: _____

Print Title: _____ (Attach Power of Attorney)

Witness:

(Additional signatures, if any, appear on attached page)

Constructor: _____ (seal)

BY:

Print Name: _____

Print Title: _____

Witness:

(Additional signatures, if any, appear on attached page)

SECTION 00 5200

AGREEMENT FORM

PART 1 - GENERAL

1.01 AGREEMENT FORM

- A. The Form of Agreement to be used on this project is a modified ConsensusDocs 802. A sample is attached following this page.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

ConsensusDocs 802

STANDARD FORM OF AGREEMENT BETWEEN OWNER AND TRADE CONTRACTOR

(Where the Construction Manager Is the Owner's Agent)



TABLE OF ARTICLES

1. AGREEMENT
2. GENERAL PROVISIONS
3. TRADE CONTRACTOR'S OBLIGATIONS
4. OWNER'S RESPONSIBILITIES
5. SUBCONTRACTS
6. TRADE CONTRACT TIME
7. TRADE CONTRACT PRICE
8. CHANGES
9. PAYMENT
10. INDEMNITY, INSURANCE, WAIVERS AND BONDS
11. SUSPENSION, NOTICE TO CURE AND TERMINATION OF AGREEMENT
12. DISPUTE MITIGATION AND RESOLUTION
13. MISCELLANEOUS PROVISIONS
14. TRADE CONTRACT DOCUMENTS

This Agreement has important legal and insurance consequences. Consultations with an attorney and with insurance and surety consultants are encouraged with respect to its completion or modification. Notes indicate where information is to be inserted to complete this Agreement.



ARTICLE 1 AGREEMENT

This Trade Contractor Agreement is made effective as of the XX day of Month, Year , by and between the

OWNER

State of Iowa - DAS, Department of Administrative Services ("DAS"). DAS's principal office is located: 109 SE 13th Street, Des Moines, IA 50319-0120.

and the

TRADE CONTRACTOR

Contractor Name

Address

City, State, Zip

for work in connection with the following

PROJECT

XXXX.XX - Project Name

The CONSTRUCTION MANAGER is

Construction Manager Name

Address

City, State, Zip

The DESIGN PROFESSIONAL for the Project is

Designer Name

Address

City, State, Zip

Notice to the Parties shall be given at the above addresses.

ARTICLE 2 GENERAL PROVISIONS

2.1 RELATIONSHIP OF PARTIES The Owner and the Trade Contractor agree to proceed with this Agreement on the basis of mutual trust, good faith and fair dealing and shall cooperate with each other and with the Construction Manager and Design Professional in furthering the Owner's interests. The Trade Contractor shall use its diligent efforts to perform the work in an expeditious manner consistent with the Trade Contract Documents. The Owner and the Trade Contractor will endeavor to promote harmony and cooperation among all Project participants.

2.1.1 The Owner and the Trade Contractor shall perform their obligations with integrity, ensuring at a minimum that

2.1.1.1 conflicts of interest shall be avoided or disclosed promptly to the other Party; and

2.1.1.2 the Trade Contractor and the Owner warrant that they have not and shall not pay nor receive any contingent fees or gratuities to or from the other Party, including its agents, officers and employees, Subcontractors or others for whom they may be liable, to secure preferential



treatment.

2.2 PROJECT ORGANIZATION This Agreement is for the performance of work described herein in connection with the construction of the Project. The Owner also may enter into separate agreements with other trade contractors for other portions of the Project. The Owner has entered or will enter into a Construction Management Agreement with the Construction Manager, and a design agreement with the Design Professional.

2.3 INDEPENDENT CONTRACTOR The Trade Contractor represents that it is an independent contractor and that its performance of the Trade Contract Work it shall act as an independent contractor. Neither Trade Contractor nor any of its agents or employees shall act on behalf of the Owner except as provided in this Agreement or unless authorized in writing by the Owner.

2.4 CONSTRUCTION MANAGER IS OWNER'S AGENT The Construction Manager will represent the Owner as its agent in the administration and management of this Agreement. Any instructions, reviews, approvals, orders or directions given to the Trade Contractor by the Construction Manager will be given on behalf of and as agent for the Owner. The Trade Contractor shall be obligated to respond or perform as if the same were given directly by the Owner. The Trade Contractor shall communicate and provide all requests and concerns regarding the Trade Contract Work to the Construction Manager. The Trade Contractor shall provide copies to the Construction Manager of all notices to the Owner required by and regarding this Agreement.

2.5 CONSTRUCTION MANAGER NOT IN PRIVITY WITH TRADE CONTRACTOR This Agreement shall not give the Trade Contractor any claim or right of action against the Construction Manager. The Trade Contractor and its subcontractors shall not be beneficiaries of any obligations of the Construction Manager. This Agreement shall not create a contractual relationship between any parties except the Owner and the Trade Contractor.

2.5A NO THIRD-PARTY BENEFICIARY There are no third-party beneficiaries of this Agreement.

2.6 DESIGN PROFESSIONAL The Owner, through its Design Professional, shall provide all architectural and engineering design services necessary for the completion of the Work, except the following:

No exceptions

The Trade Contractor shall not be required to provide professional services which constitute the practice of architecture or engineering except as otherwise provided in section 3.15.

2.6.1 The Owner shall obtain from the Design Professional either a license for Trade Contractor and Subcontractors to use the design documents prepared by the Design Professional or ownership of the copyrights for such design documents, and shall defend, indemnify and hold harmless the Trade Contractor against any suits or claims of infringement of any copyrights or licenses arising out of the use of the design documents. To the extent portions of this paragraph are in conflict with SF 396 (codified at Iowa Code Section 537A.5) said portions are void and unenforceable.

2.7 EXTENT OF AGREEMENT This Agreement is solely for the benefit of the Parties, represents the entire integrated agreement between the Parties, and supersedes all prior negotiations, representations and agreements, either written or oral. This Agreement and each and every provision is for the exclusive benefit of the Owner and the Trade Contractor and not for the benefit of any third party except to the extent expressly provided in this Agreement. In the event of conflict between this Agreement and any of the Exhibits or any other documents incorporated into this Agreement, the terms and provisions of this Agreement shall control.

2.8 DEFINITIONS



2.8.1 Agreement means this ConsensusDocs 802 Standard Form of Agreement Between Owner and Trade Contractor (Where the Construction Manager is the Owner's Agent), as modified by the Parties, and Exhibits and Attachments made part of this Agreement upon its execution.

2.8.2 Design Professional means the Architect, Design Professional or Engineer identified in ARTICLE 1 and its consultants, retained by Owner to perform design services for the Project, and licensed in the State in which the Project is located. The use of the term Design Professional in this Agreement is for convenience and is not intended to imply or infer that the individual or entity named in ARTICLE 1 will provide design professional services in a discipline in which it is not licensed.

2.8.3 Construction Manager means the Construction Manager identified in ARTICLE 1 and its authorized representative.

2.8.4 The Construction Schedule is the document initially prepared by and updated by the Construction Manager and approved by the Owner that indicates proposed activity sequences, durations, or milestone dates for such activities as receipt and approval of pertinent information, issuance of the Construction Documents, the preparation and processing of shop drawings and samples, delivery of materials or equipment requiring long-lead-time procurement, Owner's occupancy requirements and estimated dates of Substantial Completion and Final Completion of the Project.

2.8.5 The term Day shall mean calendar day unless otherwise specifically defined.

2.8.6 Final Completion occurs on the date when the Trade Contractor's obligations under this Agreement are complete and accepted by the Owner and final payment becomes due and payable, as established in ARTICLE 6. This date shall be confirmed by a Certificate of Final Completion signed by the Owner and the Trade Contractor.

2.8.7 A Hazardous Material is any substance or material identified now or in the future as toxic or hazardous under any federal, state or local law or regulation, or any other substance or material which may be considered hazardous or otherwise subject to statutory or regulatory requirements governing handling, disposal or clean-up.

2.8.8 A Material Supplier is a person or entity retained by the Trade Contractor to provide material or equipment for the Trade Contract Work. This definition is not intended to, and shall not be interpreted to, expand or modify the definition(s) of materials or material suppliers contained in Iowa Code Chapter 573.

2.8.9 Others means other contractors, material suppliers, and persons at the Worksite who are not employed by the Trade Contractor or Subcontractors.

2.8.10 The term Overhead shall mean a) payroll costs and other compensation of Trade Contractor employees in the Trade Contractor's principal and branch offices; b) general and administrative expenses of the Trade Contractor's principal and branch offices including deductibles paid on any insurance policy and c) the Trade Contractor's capital expenses, including interest on capital used for the Work.

2.8.11 Owner is the person or entity identified in ARTICLE 1 as Owner, and includes the Owner's representative.

2.8.12 The Project, as identified in ARTICLE 1, is the building, facility or other improvements for which the Trade Contractor is to perform the Trade Contract Work.

2.8.13 A Subcontractor is a person or entity retained by the Trade Contractor as an independent contractor to provide the labor, materials, equipment or services necessary to complete a specific



portion of the Work. This definition is not intended to, and shall not be interpreted to, expand or modify the definition(s) of materials or material suppliers contained in Iowa Code Chapter 573.

2.8.14 Per Iowa Code Section 26.13, "substantially completed" means the first date on which any of the following occurs: (1) Completion of the Project (or Trade Contract Work, in the case of the multiple Trade Contractors) or when the Project (or Trade Contract Work in the case of multiple Trade Contractors) has been substantially completed in general accordance with the terms and provisions of the contract. (2) The work on the Project (or Trade Contract Work in the case of multiple Trade Contractors) or on the designated portion is substantially completed in general accordance with the terms of the contract so that the State Iowa can occupy or utilize the Project or designated portion of the Project for its intended purpose. (3) The Project (or Trade Contract Work in the case of multiple Trade Contractors) is certified as having been substantially completed by either of the following: (a) the architect or engineer authorized to make such certification (which is defined in this Agreement as the Design Professional). (b) The authorized contract representative (which is defined in this Agreement as the Owner's Representative). (4) The State of Iowa is occupying or utilizing the Project (or Trade Contract Work in the case of multiple Trade Contractors) for its intended purpose. This subparagraph shall not apply to highway, bridge, or culvert projects.

2.8.15 Terrorism means a violent act, or an act that is dangerous to human life, property or infrastructure, that is committed by an individual or individuals and that appears to be part of an effort to coerce a civilian population or to influence the policy or affect the conduct of any government by coercion. Terrorism includes, but is not limited to, any act certified by the United States government as an act of terrorism pursuant to the Terrorism Risk Insurance Act, as amended.

2.8.16 A Trade Contract Change Order is a written order signed by the Owner and the Trade Contractor after execution of this Agreement, indicating changes in the scope of the Trade Contract Work, the Trade Contract Price or Trade Contract Time, including substitutions proposed by the Trade Contractor and accepted by the Owner. Trade Contract Change Orders shall be executed using the ConsensusDOCS 813 Trade Contract Change Order (CM as Owner's Agent) form document with exhibits attached as necessary.

2.8.17 The Trade Contract Documents consist of this Agreement (as modified), the drawings, specifications, addenda issued prior to execution of this Agreement, approved submittals, information furnished by the Owner under subsection 4.1.3, the bid documents, other documents listed in this Agreement and any modifications issued after execution.

2.8.18 The Trade Contract Price is the amount indicated in section 7.1 of this Agreement.

2.8.19 The Trade Contract Time is the period between the Date of Commencement and Final Completion.

2.8.20 Trade Contract Work means the construction and services provided by the Trade Contractor.

2.8.20.1 Changed Work means work that is different from the original scope of Trade Contract Work; or work that changes the Trade Contract Price or Trade Contract Time.

2.8.20.2 Defective Work is any portion of the Trade Contract Work that is not in conformance with the Trade Contract Documents.

2.8.21 The Trade Contractor is the person or entity identified in ARTICLE 1 and includes the Trade Contractor's Representative.

2.8.22 The term Work means the construction and services necessary or incidental to fulfill the Trade



Contractors' obligations for the Project. The Work may refer to the whole Project or only a part of the Project.

2.8.23 Worksite means the geographical area at the location of the Project as identified in ARTICLE 1 where the Trade Contract Work is to be performed.

ARTICLE 3 TRADE CONTRACTOR'S OBLIGATIONS

3.1 GENERAL RESPONSIBILITIES

3.1.1 RESPONSIBILITIES The Trade Contractor shall provide all of the labor, materials, equipment and services necessary to complete the Trade Contract Work, all of which shall be provided in full accord with or as reasonably inferable from the Trade Contract Documents as being necessary to produce the indicated results.

3.1.2 The Trade Contractor shall be responsible for the supervision and coordination of the Trade Contract Work, including the construction means, methods, techniques, sequences and procedures utilized, unless the Trade Contract Documents give other specific instructions. In such case, the Trade Contractor shall not be liable to the Owner for damages resulting from compliance with such instructions unless the Trade Contractor recognized and failed to timely report to the Owner any error, inconsistency, omission or unsafe practice that it discovered in the specified construction means, methods, techniques, safety, sequences or procedures.

3.1.3 The Trade Contractor shall perform Trade Contract Work only within locations allowed by the Trade Contract Documents, applicable permits and applicable local law.

3.2 COOPERATION WITH WORK OF OWNER AND OTHERS

3.2.1 The Owner may perform work at the Worksite directly or by Others. Any agreements with Others to perform construction or operations related to the Project shall include provisions pertaining to insurance, indemnification, waiver of subrogation, coordination, interference, clean up and safety which are substantively the same as the corresponding provisions of this Agreement.

3.2.2 In the event that the Owner elects to perform work at the Worksite directly or by Others, the Trade Contractor and the Owner shall, with the assistance of the Construction Manager, coordinate the activities of all forces at the Worksite and agree upon fair and reasonable schedules and operational procedures for Worksite activities. The Owner shall require each separate contractor to cooperate with the Trade Contractor and assist with the coordination of activities and the review of construction schedules and operations. The Trade Contract Price and Trade Contract Time shall be equitably adjusted, as mutually agreed by the Parties, for subsequent changes made necessary by the coordination of construction activities, and the Trade Contractor's construction schedule and the Construction Schedule shall be revised accordingly. The Trade Contractor, Owner and Others shall adhere to the revised Construction Schedule until it may subsequently be revised.

3.2.3 With regard to the work of the Owner and Others, the Trade Contractor shall (a) proceed with the Trade Contract Work in a manner which does not hinder, delay or interfere with the work of the Owner or Others or cause the work of the Owner or Others to become defective, (b) afford the Owner or Others reasonable access for introduction and storage of their materials and equipment and performance of their activities, and (c) coordinate the Trade Contractor's construction and operations with theirs as required by this section.

3.2.4 Before proceeding with any portion of the Trade Contract Work affected by the construction or operations of the Owner or Others, the Trade Contractor shall give the Owner and Construction



Manager prompt written notification of any defects the Trade Contractor discovers in their work which will prevent the proper execution of the Trade Contract Work. The Trade Contractor's obligations in this section do not create a responsibility for the work of the Owner or Others, but are for the purpose of facilitating the Trade Contract Work. If the Trade Contractor does not notify the Owner and Construction Manager of patent defects interfering with the performance of the Trade Contract Work, the Trade Contractor acknowledges that the work of the Owner or Others is not defective and is acceptable for the proper execution of the Trade Contract Work. Following receipt of written notice from the Trade Contractor of defects, the Owner, through the Construction Manager, shall promptly inform the Trade Contractor what action, if any, the Trade Contractor shall take with regard to the defects.

3.3 RESPONSIBILITY FOR PERFORMANCE

3.3.1 In order to facilitate its responsibilities for completion of the Work in accordance with and as reasonably inferable from the Trade Contract Documents, prior to commencing the Work the Trade Contractor shall examine and compare the drawings and specifications with information furnished by the Owner pursuant to subsection 4.1.3, relevant field measurements made by the Trade Contractor and any visible conditions at the Worksite affecting the Trade Contract Work.

3.3.2 If in the course of the performance of the obligations in subsection 3.3.1 the Trade Contractor discovers any errors, omissions or inconsistencies in the Contract Documents, the Trade Contractor shall promptly report them to the Owner and Construction Manager. It is recognized, however, that the Trade Contractor is not acting in the capacity of a licensed design professional, and that the Trade Contractor's examination is to facilitate construction and does not create an affirmative responsibility to detect errors, omissions or inconsistencies or to ascertain compliance with applicable laws, building codes or regulations. Following receipt of written notice from the Trade Contractor of defects, the Owner shall promptly inform the Trade Contractor what action, if any, the Trade Contractor shall take with regard to the defects.

3.3.3 The Trade Contractor shall have no liability for errors, omissions or inconsistencies discovered under subsections 3.3.1 and 3.3.2 unless the Trade Contractor fails to report a recognized problem to the Owner and Construction Manager.

3.3.4 The Trade Contractor may be entitled to additional costs or time if there are changes in the scope of the Trade Contract Work that increase the cost of the Work or increase the number of days required to perform the Work, respectively, because of clarifications or instructions arising out of the Trade Contractor's reports described in the three preceding Subsections.

3.4 CONSTRUCTION PERSONNEL AND SUPERVISION

3.4.1 The Trade Contractor shall provide competent supervision for the performance of the Trade Contract Work. Before commencing the Trade Contract Work, Trade Contractor shall notify Owner and Construction Manager in writing of the name and qualifications of its proposed superintendent(s) and project manager so Owner and Construction Manager may review the individual's qualifications. If, for reasonable cause, the Owner or Construction Manager refuses to approve the individual, or withdraws its approval after once giving it, Trade Contractor shall name a different superintendent or project manager for Owner's and Construction Manager's review. Any disapproved superintendent shall not perform in that capacity thereafter at the Worksite.

3.4.2 The Trade Contractor shall be responsible to the Owner for acts or omissions of parties or entities performing portions of the Trade Contract Work for or on behalf of the Trade Contractor or any of its Subcontractors.

3.4.3 The Trade Contractor shall permit only qualified persons to perform the Trade Contract Work. The



Trade Contractor shall enforce safety procedures, strict discipline and good order among persons performing the Trade Contract Work. If the Owner or Construction Manager determines that a particular person does not follow safety procedures, or is unfit or unskilled for the assigned work, the Trade Contractor shall immediately reassign the person on receipt of the Owner's or Construction Manager's written notice to do so.

3.4.4 TRADE CONTRACTOR'S REPRESENTATIVE The Trade Contractor's authorized representative is . The Trade Contractor's representative shall possess full authority to receive instructions from the Owner and to act on those instructions. The Trade Contractor shall notify the Owner and the Construction Manager in writing of a change in the designation of the Trade Contractor's representative. The Trade Contractor's representative is also authorized to bind the Trade Contractor in all matters relating to this Agreement including, without limitation, all matters requiring the Trade Contractor's approval, authorization, or written notice. The Trade Contractor's representative is also authorized to resolve disputes in accordance with Section 12.2 of this Agreement.

3.5 MATERIALS FURNISHED BY THE OWNER OR OTHERS

3.5.1 In the event the Trade Contract Work includes installation of materials or equipment furnished by the Owner or Others, it shall be the responsibility of the Trade Contractor to examine the items so provided and thereupon handle, store and install the items, unless otherwise provided in the Trade Contract Documents, with such skill and care as to provide a satisfactory and proper installation. Loss or damage due to acts or omissions of the Trade Contractor shall be the responsibility of the Trade Contractor and may be deducted from any amounts due or to become due the Trade Contractor. Any defects discovered in such materials or equipment shall be reported at once to the Owner and Construction Manager. Following receipt of written notice from the Trade Contractor of defects, the Owner shall promptly inform the Trade Contractor what action, if any, the Trade Contractor shall take with regard to the defects.

3.6 TESTS AND INSPECTIONS

3.6.1 The Trade Contractor shall schedule all required tests, approvals and inspections of the Trade Contract Work or portions thereof at appropriate times so as not to delay the progress of the Trade Contract Work or other work related to the Project. The Trade Contractor shall give proper notice to the Construction Manager and to all required parties of such tests, approvals and inspections. If feasible, the Owner and Others may timely observe the tests at the normal place of testing. Except as provided in subsection 3.6.3, the Owner shall bear all expenses associated with tests, inspections and approvals required by the Trade Contract Documents, which, unless otherwise agreed to, shall be conducted by an independent testing laboratory or entity retained by the Owner. Unless otherwise required by the Trade Contract Documents, required certificates of testing, approval or inspection shall be secured by the Trade Contractor and promptly delivered to the Owner and Construction Manager.

3.6.2 If the Owner, Construction Manager or appropriate authorities determine that tests, inspections or approvals in addition to those required by the Trade Contract Documents will be necessary, the Trade Contractor shall arrange for the procedures and give timely notice to the Owner, Construction Manager and Others who may observe the procedures. Costs of the additional tests, inspections or approvals are at the Owner's expense except as provided in subsection 3.6.3.

3.6.3 If the procedures described in subsections 3.6.1 and 3.6.2 indicate that portions of the Trade Contract Work fail to comply with the Trade Contract Documents, the Trade Contractor shall be responsible for costs of correction and retesting.

3.7 WARRANTY



3.7.1 The Trade Contract Work shall be executed in accordance with the Trade Contract Documents in a workmanlike manner. The Trade Contractor warrants that all materials and equipment shall be furnished in sufficient quantities to facilitate the proper and expeditious execution of the Trade Contract Work and shall be new unless otherwise specified, of good quality, in conformance with the Trade Contract Documents, and free from defective workmanship and materials. At the Owner's or Construction Manager's request, the Trade Contractor shall furnish satisfactory evidence of the quality and type of materials and equipment furnished. The Trade Contractor further warrants that the Trade Contract Work shall be free from material defects not intrinsic in the design or materials required in the Trade Contract Documents. The Trade Contractor's warranty does not include remedies for defects or damages caused by normal wear and tear during normal usage, use for a purpose for which the Project was not intended, improper or insufficient maintenance, modifications performed by the Owner or Others, or abuse. The Trade Contractor's warranty pursuant to this section shall commence on the Date of Substantial Completion.

3.7.2 The Trade Contractor shall obtain from its Subcontractors and material suppliers any special or extended warranties required by the Trade Contract Documents. All such warranties shall be listed in an attached Exhibit to this Agreement.

3.8 CORRECTION OF TRADE CONTRACT WORK WITHIN ONE YEAR

3.8.1 If, prior to Substantial Completion and within one year after the date of Substantial Completion of the Trade Contract Work, any Defective Work is found, the Owner shall promptly notify the Trade Contractor in writing. Unless the Owner provides written acceptance of the condition, the Trade Contractor shall promptly correct the Defective Work at its own cost and time and bear the expense of additional services required for correction of any Defective Work for which it is responsible. If within the one-year correction period the Owner discovers and does not promptly notify the Trade Contractor or give the Trade Contractor an opportunity to test or correct Defective Work as reasonably requested by the Trade Contractor, the Owner waives the Trade Contractor's obligation to correct that Defective Work as well as the Owner's right to claim a breach of the warranty with respect to that Defective Work.

3.8.2 With respect to any portion of Trade Contract Work first performed after Substantial Completion, the one-year correction period shall be extended by the period of time between Substantial Completion and the actual performance of the later Trade Contract Work. Correction periods shall not be extended by corrective work performed by the Trade Contractor.

3.8.3 If the Trade Contractor fails to correct Defective Work within a reasonable time after receipt of written notice from the Owner prior to final payment, the Owner may correct it in accordance with the Owner's right to carry out the Trade Contract Work in section 11.2. In such case, an appropriate Trade Contract Change Order shall be issued deducting the cost of correcting such deficiencies from payments then or thereafter due the Trade Contractor. If payments then or thereafter due Trade Contractor are not sufficient to cover such amounts, the Trade Contractor shall pay the difference to the Owner.

3.8.4 If after the one-year correction period but before the applicable limitation period the Owner discovers any Defective Work, the Owner shall, unless the Defective Work requires emergency correction, promptly notify the Trade Contractor. If the Trade Contractor elects to correct the Defective Work, it shall provide written notice of such intent within fourteen (14) Days of its receipt of notice from the Owner. The Trade Contractor shall complete the correction of Defective Work within a time frame mutually agreed upon by the Trade Contractor and the Owner. If the Trade Contractor does not elect to correct the Defective Work, the Owner may have the Defective Work corrected by itself or Others and charge the Trade Contractor for the reasonable cost of the correction and other directly related



expenses. Owner shall provide Trade Contractor with an accounting of correction costs it incurs.

3.8.5 If the Trade Contractor's correction or removal of Defective Work causes damage to or destroys other completed or partially completed Work or existing buildings, the Trade Contractor shall be responsible for the cost of correcting the destroyed or damaged property.

3.8.6 The one-year period for correction of Defective Work does not constitute a limitation period with respect to the enforcement of the Trade Contractor's other obligations under the Trade Contract Documents.

3.8.7 Prior to final payment, at the Owner's option and with the Trade Contractor's agreement, the Owner may elect to accept Defective Work rather than require its removal and correction. In such case the Contract Price shall be equitably adjusted for any diminution in the value of the Project caused by such Defective Work. Before the Owner accepts any such change it must be documented in writing with a Change Order signed by both the Trade Contractor and Owner.

3.9 CORRECTION OF COVERED TRADE CONTRACT WORK

3.9.1 On request of the Owner or Construction Manager, Trade Contract Work that has been covered without a requirement that it be inspected prior to being covered may be uncovered for the Owner's or Construction Manager's inspection. The Owner shall pay for the costs of uncovering and replacement if the Work proves to be in conformance with the Trade Contract Documents, or if the defective condition was caused by the Owner or Others. If the uncovered Trade Contract Work proves to be defective, the Trade Contractor shall pay the costs of uncovering and replacement.

3.9.2 If contrary to specific requirements in the Trade Contract Documents or contrary to a specific request from the Owner or Construction Manager, a portion of the Trade Contract Work is covered, the Owner or Construction Manager, by written request, may require the Trade Contractor to uncover the Trade Contract Work for the Owner's or Construction Manager's observation. In this circumstance the Trade Contract Work shall be uncovered and recovered at the Trade Contractor's expense and with no adjustment to the Trade Contract Time. Costs incurred by the Owner as a direct result of the above shall be deducted from the Trade Contract Price.

3.10 SAFETY OF PERSONS AND PROPERTY

3.10.1 SAFETY PRECAUTIONS AND PROGRAMS The Trade Contractor shall have overall responsibility for safety precautions and programs in the performance of the Trade Contract Work. While this section establishes the responsibility for safety between the Owner and Trade Contractor, it does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with the provisions of applicable laws and regulations.

3.10.2 The Trade Contractor shall seek to avoid injury, loss or damage to persons or property by taking reasonable steps to protect:

3.10.2.1 its employees and other persons at the Worksite;

3.10.2.2 materials and equipment stored at on-site or off-site locations for use in the Trade Contract Work; and

3.10.2.3 property located at the site and adjacent to Trade Contract Work areas, whether or not the property is part of the Trade Contract Work.

3.10.3 TRADE CONTRACTOR'S SAFETY REPRESENTATIVE The Trade Contractor's Worksite Safety Representative is who shall act as the Trade Contractor's authorized safety representative with a duty



to prevent accidents in accordance with subsection 3.10.2 If no individual is identified in this section, the authorized safety representative shall be the Trade Contractor's Representative. The Trade Contractor shall report immediately in writing to the Owner and Construction Manager all recordable accidents and injuries occurring at the Worksite. When the Trade Contractor is required to file an accident report with a public authority, the Trade Contractor shall furnish a copy of the report to the Owner and Construction Manager.

3.10.4 The Trade Contractor shall provide the Owner and Construction Manager with copies of all notices required of the Trade Contractor by law or regulation. The Trade Contractor's safety program shall comply with the requirements of governmental and quasi-governmental authorities having jurisdiction.

3.10.5 Damage or loss not insured under property insurance which may arise from the Trade Contract Work, to the extent caused by the negligent acts or omissions of the Trade Contractor, or anyone for whose acts the Trade Contractor may be liable, shall be promptly remedied by the Trade Contractor.

3.10.6 If the Owner or Construction Manager deems any part of the Trade Contract Work or Worksite unsafe, the Owner or Construction Manager, without assuming responsibility for the Trade Contractor's safety program, may require the Trade Contractor to stop performance of the Trade Contract Work or take corrective measures satisfactory to the Owner, or both. If the Trade Contractor does not adopt corrective measures, the Owner may perform them and deduct their cost from the Trade Contract Price. The Trade Contractor agrees to make no claim for damages, for an increase in the Trade Contract Price or for a change in the Trade Contract Time based on the Trade Contractor's compliance with the Owner's or Construction Manager's reasonable request.

3.11 EMERGENCIES

3.11.1 In an emergency, the Trade Contractor shall act in a reasonable manner to prevent personal injury or property damage. Any change in the Trade Contract Price or Trade Contract Time resulting from the actions of the Trade Contractor in an emergency situation shall be determined as provided in ARTICLE 8.

3.12 HAZARDOUS MATERIALS

3.12.1 The Trade Contractor shall not be obligated to commence or continue Trade Contract Work until any Hazardous Material discovered at the Worksite has been removed, rendered or determined to be harmless by the Owner as certified by an independent testing laboratory and approved by the appropriate government agency.

3.12.2 If after the commencement of the Trade Contract Work a Hazardous Material is discovered at the Worksite, the Trade Contractor shall be entitled to immediately stop Trade Contract Work in the affected area. The Trade Contractor shall report the condition to the Owner, the Construction Manager, and, if required, the government agency with jurisdiction.

3.12.3 The Trade Contractor shall not be required to perform any Trade Contract Work relating to or in the area of Hazardous Material without written mutual agreement.

3.12.4 The Owner shall be responsible for retaining an independent testing laboratory to determine the nature of the Hazardous Material encountered and whether the material requires corrective measures or remedial action. Such measures shall be the sole responsibility of the Owner, and shall be performed in a manner minimizing any adverse effects upon the Trade Contract Work. The Trade Contractor shall resume Trade Contract Work in the area affected by any Hazardous Material only upon written agreement between the Parties after the Hazardous Material has been removed or rendered harmless



and only after approval, if necessary, of the governmental agency with jurisdiction.

3.12.5 If the Trade Contractor incurs additional costs or is delayed due to the presence or remediation of Hazardous Material, the Trade Contractor shall be entitled to an equitable adjustment in the Trade Contract Price or the Trade Contract Time.

3.12.6 To the extent not caused by the negligent acts or omissions of the Trade Contractor, its Subcontractors and Sub-subcontractors, and the agents, officers, directors and employees of each of them, the Owner shall defend, indemnify and hold harmless the Trade Contractor, its Subcontractors and Sub-subcontractors, and the agents, officers, directors and employees of each of them, from and against any and all direct claims, damages, losses, costs and expenses, including but not limited to attorney's fees, costs and expenses incurred in connection with any dispute resolution process, to the extent permitted pursuant to section 6.6, arising out of or relating to the performance of the Trade Contract Work in any area affected by Hazardous Material. To the extent portions of this paragraph are in conflict with SF 396 (codified at Iowa Code Section 537A.5) said portions are void and unenforceable.

3.12.7 MATERIALS BROUGHT TO THE WORKSITE

3.12.7.1 Material Safety Data (MSD) sheets as required by law and pertaining to materials or substances used or consumed in the performance of the Trade Contract Work, whether obtained by the Trade Contractor, Subcontractors, the Owner or Others, shall be maintained at the Worksite by the Trade Contractor and made available to the Owner, Construction Manager, Subcontractors and Others.

3.12.7.2 The Trade Contractor shall be responsible for the proper delivery, handling, application, storage, removal and disposal of all materials and substances brought to the Worksite by the Trade Contractor in accordance with the Trade Contract Documents and used or consumed in the performance of the Trade Contract Work.

3.12.7.3 The Trade Contractor shall indemnify and hold harmless the Owner, Construction Manager, their agents, officers, directors and employees, from and against any and all claims, damages, losses, costs and expenses, including but not limited to attorney's fees, costs and expenses incurred in connection with any dispute resolution procedure, arising out of or relating to the delivery, handling, application, storage, removal and disposal of all materials and substances brought to the Worksite by the Trade Contractor in accordance or not in accordance with the Trade Contract Documents. To the extent portions of this paragraph are in conflict with SF 396 (codified at Iowa Code Section 537A.5) said portions are void and unenforceable.

3.12.8 The terms of this section shall survive the completion of the Trade Work or any termination of this Agreement.

3.13 SUBMITTALS

3.13.1 The Trade Contractor shall submit to the Construction Manager, and the Design Professional, for review and approval all shop drawings, samples, product data and similar submittals required by the Trade Contract Documents. Submittals may be submitted in electronic form if required in accordance with ConsensusDocs 200.2 and subsection 4.4.1. The Trade Contractor shall be responsible to the Owner for the accuracy and conformity of its submittals to the Trade Contract Documents. The Trade Contractor shall prepare and deliver its submittals in a manner consistent with the Construction Schedule and in such time and sequence so as not to delay the performance of the Trade Contract Work or the work of the Owner and Others. When the Trade Contractor delivers its submittals the Trade Contractor shall identify in writing for each submittal all changes, deviations or substitutions from the requirements of the Trade Contract Documents. The review and approval of any Trade Contractor



submittal shall not be deemed to authorize changes, deviations or substitutions from the requirements of the Trade Contract Documents unless express written approval is obtained from the Owner specifically authorizing such deviation, substitution or change. To the extent a change, deviation or substitution causes an impact to the Contract Price or Contract Time, such approval shall be promptly memorialized in a Change Order. Further, the Construction Manager and Design Professional shall not make any change, deviation or substitution through the submittal process without specifically identifying and authorizing such deviation to the Trade Contractor. In the event that the Trade Contract Documents do not contain submittal requirements pertaining to the Trade Contract Work, the Trade Contractor agrees upon request to submit in a timely fashion to the Construction Manager and the Design Professional for review and approval any shop drawings, samples, product data, manufacturers' literature or similar submittals as may reasonably be required by the Owner, Construction Manager, or Design Professional.

3.13.2 The Owner shall be responsible for review and approval of submittals with reasonable promptness to avoid causing delay.

3.13.3 The Trade Contractor shall perform all Trade Contract Work strictly in accordance with approved submittals. Approval of shop drawings is not authorization to Trade Contractor to perform Changed Work, unless the procedures of ARTICLE 8 are followed. Approval does not relieve the Trade Contractor from responsibility for Defective Work resulting from errors or omissions of any kind on the approved Shop Drawings.

3.13.4 Record copies of the following, incorporating field changes and selections made during construction, shall be maintained by the Trade Contractor at the Project site and available to the Owner upon request: drawings, specifications, addenda, Trade Contract Change Order and other modifications, and required submittals including product data, samples and shop drawings.

3.13.5 No substitutions shall be made in the Trade Contract Work unless permitted in the Trade Contract Documents and then only after the Trade Contractor obtains approvals required under the Trade Contract Documents for substitutions. All such substitutions shall be promptly memorialized in a Change Order no later than seven (7) Days following approval by the Owner and, if applicable, provide for an adjustment in the Contract Price or Contract Time.

3.13.6 The Trade Contractor shall prepare and submit to the Construction Manager for submission to the Owner

(Check one only)

- ☒ final marked up as-built drawings
- ☐ updated electronic data, in accordance with ConsensusDocs 200.2 and section 4.4.1
- ☐ such documentation as defined by the Parties by attachment to this Agreement,

in general documenting how the various elements of the Trade Contract Work were actually constructed or installed.

3.14 PROFESSIONAL SERVICES

3.14.1 The Trade Contractor may be required to procure professional services in order to carry out its responsibilities for construction means, methods, techniques, sequences and procedures for such services specifically called for by the Contract Documents. The Trade Contractor shall obtain these professional services and any design certifications required from State of Iowa licensed design professionals. All drawings, specifications, calculations, certifications and submittals prepared by such



design professionals shall bear the signature and seal of such design professionals and the Owner and the Design Professional shall be entitled to rely upon the adequacy, accuracy and completeness of such design services. If professional services are specifically required by the Contract Documents, the Owner shall indicate all required performance and design criteria. The Trade Contractor shall not be responsible for the adequacy of such performance and design criteria. The Trade Contractor shall not be required to provide such services in violation of existing laws, rules and regulations in the jurisdiction where the Project is located.

3.15 WORKSITE CONDITIONS

3.15.1 WORKSITE VISIT The Trade Contractor acknowledges that it has visited, or has had the opportunity to visit, the Worksite to visually inspect the general and local conditions which could affect the Trade Contract Work.

3.15.2 CONCEALED OR UNKNOWN SITE CONDITIONS If the conditions at the Worksite are (a) subsurface or other concealed physical conditions which are materially different from those indicated in the Trade Contract Documents, or (b) unusual and unknown physical conditions which are materially different from conditions ordinarily encountered and generally recognized as inherent in Trade Contract Work provided for in the Trade Contract Documents, the Trade Contractor shall stop Trade Contract Work and give immediate written notice of the condition to the Owner, Construction Manager and the Design Professional. The Trade Contractor shall not be required to perform any work relating to the unknown condition without the written mutual agreement of the Parties. Any change in the Contract Price or the Contract Time as a result of the unknown condition shall be determined as provided in this article. The Trade Contractor shall provide the Owner and the Construction Manager with written notice of any claim as a result of unknown conditions within the time period set forth in section 8.4.

3.16 PERMITS AND TAXES

3.16.1 Trade Contractor shall give public authorities all notices required by law and, except for permits and fees which are the responsibility of the Owner pursuant to section 4.2, shall obtain and pay for all necessary permits, licenses and renewals pertaining to the Trade Contract Work. Trade Contractor shall provide to Owner copies of all notices, permits, licenses and renewals required under this Agreement.

3.16.2 Trade Contractor shall pay all applicable taxes legally enacted when bids are received or negotiations concluded for the Trade Contract Work provided by the Trade Contractor.

3.16.3 The Contract Price or Contract Time shall be equitably adjusted by Trade Contract Change Order for additional costs resulting from any changes in laws, ordinances, rules and regulations enacted after the date of this Agreement, including increased taxes.

3.16.3 (Deleted)

3.17 CUTTING, FITTING AND PATCHING

3.17.1 The Trade Contractor shall perform cutting, fitting and patching necessary to coordinate the various parts of the Trade Contract Work and to prepare its Trade Contract Work for the work of the Owner or Others.

3.17.2 Cutting, patching or altering the work of the Owner or Others shall be done with the prior written approval of the Owner. Such approval shall not be unreasonably withheld.

3.18 CLEANING UP

3.18.1 The Trade Contractor shall regularly remove debris and waste materials at the Worksite resulting



from the Trade Contract Work. Prior to discontinuing Trade Contract Work in an area, the Trade Contractor shall clean the area and remove all rubbish and its construction equipment, tools, machinery, waste and surplus materials. The Trade Contractor shall minimize and confine dust and debris resulting from construction activities. At the completion of the Trade Contract Work, the Trade Contractor shall remove from the Worksite all construction equipment, tools, surplus materials, waste materials and debris.

3.18.2 If the Trade Contractor fails to commence compliance with cleanup duties within two (2) business Days after written notification from the Owner or the Construction Manager of noncompliance, the Owner may implement appropriate cleanup measures without further notice and the cost shall be deducted from any amounts due or to become due the Trade Contractor in the next payment period.

3.19 ACCESS TO TRADE CONTRACT WORK The Trade Contractor shall facilitate the access of the Owner, Construction Manager, Design Professional and Others to Trade Contract Work in progress.

3.20 COST MONITORING The Trade Contractor shall provide the Construction Manager with cost monitoring information appropriate for the manner of Trade Contractor's compensation, to enable the Construction Manager to develop and track construction and project budgets, including amounts for work in progress, uncompleted work and proposed changes.

3.21 ROYALTIES, PATENTS AND COPYRIGHTS The Trade Contractor shall pay all royalties and license fees which may be due on the inclusion of any patented or copyrighted materials, methods or systems selected by the Trade Contractor and incorporated in the Trade Contract Work. The Trade Contractor shall defend, indemnify and hold the Owner harmless from all suits or claims for infringement of any patent rights or copyrights arising out of such selection. The Owner agrees to indemnify and hold the Trade Contractor harmless from any suits or claims of infringement of any patent rights or copyrights arising out of any patented or copyrighted materials, methods or systems specified by the Owner, Construction Manager and Design Professional. To the extent portions of this paragraph are in conflict with SF 396 (codified at Iowa Code Section 537A.5) said portions are void and unenforceable.

3.22 CONFIDENTIALITY The Owner shall treat as confidential information all of the Trade Contractor's estimating systems and historical and parameter cost data that may be disclosed to the Owner in connection with the performance of this Agreement if they are specified and marked as confidential and shall mark them. If a document is not marked as "Confidential" it will not be treated as such. Nothing contained herein, however, shall be interpreted in a manner that modifies or is in conflict with the purpose and application of the open records laws contained in the Code of Iowa.

ARTICLE 4 OWNER'S RESPONSIBILITIES

4.1 INFORMATION SERVICES

4.1.1 FULL INFORMATION Any information or services to be provided by the Owner shall be provided in a timely manner so as not to delay the Trade Contract Work.

4.1.2 FINANCIAL INFORMATION Upon the written request of the Trade Contractor, the Owner shall provide the Trade Contractor with evidence of Project financing. If requested in writing, evidence of such financing shall be a condition precedent to the Trade Contractor's commencing or continuing the Trade Contract Work. The Trade Contractor shall be notified by the Owner prior to any material change in Project financing.

4.1.3 WORKSITE INFORMATION Except to the extent that the Trade Contractor knows of any inaccuracy, the Trade Contractor is entitled to rely on Worksite information furnished by the Owner pursuant to this subsection. To the extent the Owner has obtained, or is required elsewhere in the



Trade Contract Documents to obtain, the following Worksite information, the Owner shall provide at the Owner's expense and with reasonable promptness:

4.1.3.1 information describing the physical characteristics of the site, including surveys, site evaluations, legal descriptions, data or drawings depicting existing conditions, subsurface conditions and environmental studies, reports and investigations;

4.1.3.2 tests, inspections and other reports dealing with environmental matters, Hazardous Material and other existing conditions, including structural, mechanical and chemical tests, required by the Trade Contract Documents or by law; and

4.1.3.3 any other information or services requested in writing by the Trade Contractor which are relevant to the Trade Contractor's performance of the Trade Contract Work and under the Owner's control. The information required by subsection 4.1.3 shall be provided in reasonable detail. Legal descriptions shall include easements, title restrictions, boundaries, and zoning restrictions. Worksite descriptions shall include existing buildings and other construction and all other pertinent site conditions. Adjacent property descriptions shall include structures, streets, sidewalks, alleys, and other features relevant to the Trade Contract Work. Utility details shall include available services, lines at the Worksite and adjacent and connection points. The information shall include public and private information, subsurface information, grades, contours, and elevations, drainage data, exact locations and dimensions, and benchmarks that can be used by the Trade Contractor in laying out the Trade Contract Work. The Trade Contractor shall in writing request from the Owner any information identified in Paragraph 4.1.3 that the Trade Contractor believes the Owner has obtained but has not provided to the Trade Contractor.

4.1.3.4 OWNER'S REPRESENTATIVE The Owner's representative is test. The Owner's representative shall have authority to bind the Owner in all matters relating to this Agreement including, without limitation, all matters requiring the Owner's approval, authorization or written notice. If the Owner changes its representative as listed above, the Owner shall notify the Trade Contractor in advance in writing. The Owner's Representative is also authorized to resolve disputes in accordance with Section 12.2 of this Agreement. The Construction Manager, while unauthorized to modify the Agreement or settle a dispute without the Owner's approval, however, does have the requisite authority to act as the Owner's agent throughout the construction of the Project in accordance with the contract between the Owner and the Construction Manager (ConsensusDOCS 801 as modified by the State of Iowa).

4.2 BUILDING PERMIT, FEES AND APPROVALS Except for those permits and fees related to the Trade Contract Work which are the responsibility of the Trade Contractor pursuant to subsection 3.16.1, the Owner shall secure and pay for all other permits, approvals, easements, assessments and fees required for the development, construction, use or occupancy of permanent structures or for permanent changes in existing facilities, including the building permit.

4.3 Deleted

4.4 TRADE CONTRACT DOCUMENTS Unless otherwise specified, Owner shall provide One (1) copies of the Trade Contract Documents to the Trade Contractor without cost. Additional copies will be provided to the Trade Contractor at cost. This paragraph is not intended to be in conflict with Iowa Code Section 26.3 requirement that a sufficient number of copies of the contract documents be made available to bidders without charge (but a deposit not to exceed \$250 per set may be required). If the Trade Contractor was required to make a deposit for a set of Trade Contract Documents for purposes of bidding then the Trade Contractor may elect to have the deposit returned instead of being provided with an additional copy.



4.4.1 DIGITIZED DOCUMENTS If the Owner requires that the Owner, Design Professional, Construction Manager and Trade Contractor exchange documents and data in electronic or digital form, prior to any such exchange, the Owner, Design Professional, Construction Manager and Trade Contractor shall agree on a written protocol governing all exchanges in ConsensusDocs 200.2 or a separate Agreement, which, at a minimum, shall specify: (a) the definition of documents and data to be accepted in electronic or digital form or to be transmitted electronically or digitally; (b) management and coordination responsibilities; (c) necessary equipment, software and services; (d) acceptable formats, transmission methods and verification procedures; (e) methods for maintaining version control; (f) privacy and security requirements; and (g) storage and retrieval requirements. Except as otherwise agreed to by the Parties in writing, the Parties shall each bear their own costs as identified in the protocol. In the absence of a written protocol, use of documents and data in electronic or digital form shall be at the sole risk of the recipient.

4.5 OWNER'S CUTTING AND PATCHING Cutting, patching or altering the Trade Contract Work by the Owner or Others shall be done with the prior written approval of the Trade Contractor, which approval shall not be unreasonably withheld.

4.6 OWNER'S RIGHT TO CLEAN UP In case of a dispute between the Trade Contractor and Others with regard to respective responsibilities for cleaning up at the Worksite, the Owner may implement appropriate cleanup measures after two (2) business Days' notice and allocate the cost among those responsible during the following pay period.

4.7 COST OF CORRECTING DAMAGED OR DESTROYED WORK With regard to damage or loss attributable to the acts or omissions of the Owner or Others and not to the Trade Contractor, the Owner may either (a) promptly remedy the damage or loss or (b) accept the damage or loss. If the Trade Contractor incurs additional costs or is delayed due to such loss or damage, the Trade Contractor shall be entitled to an equitable adjustment in the Trade Contract Price or Trade Contract Time.

ARTICLE 5 SUBCONTRACTS

5.1 SUBCONTRACTORS The Trade Contract Work not performed by the Trade Contractor with its own forces shall be performed by Subcontractors.

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE TRADE CONTRACT WORK

5.2.0 The Trade Contractor must identify all Subcontractors and suppliers within 48 hours of the published date and time for which bids must be submitted, in accordance with Iowa Code Section 8A.311, as amended by House File 646 in 2011. Subcontractors and suppliers may not be changed without the approval of the Owner. Requests for changing a Subcontractor or supplier must identify the reason for the proposed change, the name of the new Subcontractor or supplier, and the change in the subcontractor or supplier price as a result of the change. Any reduction in subcontractor or supplier price as a result of the change, if the change is approved by the Owner, shall be deducted from the Trade Contract Price via a deductive Change Order. Any such changes, if approved by the Owner, which result in an increase in the Trade Contract Price shall be borne by the Trade Contractor.

5.2.1 If the Owner has a reasonable objection to any proposed subcontractor or material supplier, the Owner shall notify the Trade Contractor in writing.

5.2.2 If the Owner has reasonably and promptly objected as provided in subsection 5.2.1, the Trade Contractor shall not contract with the proposed subcontractor or material supplier, and the Trade Contractor shall propose another Subcontractor acceptable to the Owner. To the extent the substitution results in an increase or decrease in the Trade Contract Price or Trade Contract Time, an appropriate



Trade Contract Change Order shall be issued as provided in ARTICLE 8.

5.3 BINDING OF SUBCONTRACTORS The Trade Contractor agrees to bind every Subcontractor (and require every Subcontractor to so bind its subcontractors) to all the provisions of this Agreement and the Trade Contract Documents as they apply to the Subcontractor's portion of the Trade Contract Work.

5.4 Deleted

5.5 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

5.5.1 If this Agreement is terminated, each subcontract agreement shall be assigned by the Trade Contractor to the Owner, subject to the prior rights of any surety, provided that:

5.5.1.1 this Agreement is terminated by the Owner pursuant to sections 11.3 or 11.4; and

5.5.1.2 the Owner accepts such assignment after termination by notifying the Subcontractor and Trade Contractor in writing, and assumes all rights and obligations of the Contractor pursuant to each subcontract agreement.

5.5.2 If the Owner accepts such an assignment, and the Work has been suspended for more than thirty (30) consecutive Days, following termination, if appropriate, the Subcontractor's compensation shall be equitably adjusted as a result of the suspension.

ARTICLE 6 TRADE CONTRACT TIME

6.1 PERFORMANCE OF THE TRADE CONTRACT WORK

6.1.1 DATE OF COMMENCEMENT The Date of Commencement is the date of Owner's written notice to proceed unless otherwise set forth below:

6.1.2 TIME Substantial Completion of the Trade Contract Work shall be achieved in xxx (xx) Days from the Date of Commencement. Unless otherwise specified in the Certificate of Substantial Completion, the Trade Contractor shall achieve Final Completion within 30 Days after the date of Substantial Completion, subject to adjustments as provided for in the Trade Contract Documents.

6.1.3 Time limits stated above are of the essence of this Agreement.

6.1.4 Unless instructed by the Owner in writing, the Trade Contractor shall not knowingly commence the Trade Contract Work before the effective date of insurance to be provided by the Trade Contractor and Owner as required by the Trade Contract Documents.

6.2 CONSTRUCTION SCHEDULE Prior to the commencement of the construction of the Trade Contract Work, the Trade Contractor shall submit a copy of its critical path method (CPM) construction schedule showing the completion of the Trade Contract Work within the allowable number of days identified above. The Trade Contractor shall regularly update its CPM construction schedule for the Trade Contract Work and promptly furnish the Construction Manager on an ongoing basis scheduling information requested by the Construction Manager for the Trade Contract Work. In consultation with the Trade Contractor, the Construction Manager shall incorporate the Trade Contract Work and work of other trade contractors into an overall Construction Schedule for the entire Project. The Trade Contractor shall be bound by the Construction. Nothing in this Trade Contractor Agreement shall relieve the Trade Contractor of any liability for any unexcused failure to comply with its original schedule, the Construction Schedule, or any completion dates. The Construction Manager shall have the right to coordinate the Trade Contractors, including the right, if necessary, to change the time, order and priority in which the various portions of the Trade Contract Work and the other work associated with the Project shall be performed.



6.3 DELAYS AND EXTENSIONS OF TIME

6.3.1 If the Trade Contractor is delayed at any time in the commencement or progress of the Work by any cause beyond the control of the Trade Contractor, the Trade Contractor shall be entitled to an equitable extension of the Trade Contract Time if the Trade Contractor is able to show that the critical path of the Trade Contract Work was delayed by causes beyond the control of the Trade Contractor. Examples of causes beyond the control of the Trade Contractor include, but are not limited to, the following: acts or omissions of the Owner, the Design Professional, Construction Manager or Others; changes in the Work or the sequencing of the Work ordered by the Owner, or arising from decisions of the Owner that impact the time of performance of the Work; transportation delays not reasonably foreseeable; labor disputes not involving the Trade Contractor; general labor disputes impacting the Project but not specifically related to the Worksite; fire; terrorism, epidemics, adverse governmental actions, unavoidable accidents or circumstances; adverse weather conditions not reasonably anticipated; encountering Hazardous Materials; concealed or unknown conditions; delay authorized by the Owner pending dispute resolution; and suspension by the Owner under section 11.1. The Trade Contractor shall submit any requests for equitable extensions of Contract Time in accordance with the provisions of ARTICLE 8.

6.3.2 In addition, if the Trade Contractor is able to show that it incurred additional costs because the critical path of the Trade Contract Work was delayed by acts or omissions of the Owner, the Design Professional, Construction Manager or Others, changes in the Work or the sequencing of the Work ordered by the Owner, or arising from decisions of the Owner that impact the time of performance of the Work, encountering Hazardous Materials, or concealed or unknown conditions, delay authorized by the Owner pending dispute resolution or suspension by the Owner under section 11.1, then the Trade Contractor shall be entitled to an equitable adjustment in the Trade Contract Price subject to section 6.6.

6.3.3 NOTICE OF DELAYS In the event delays to the Trade Contract Work are encountered for any reason, the Trade Contractor shall provide prompt written notice to the Owner and the Construction Manager of the cause of such delays after Trade Contractor first recognizes the delay. The Owner and Trade Contractor agree to undertake reasonable steps to mitigate the effect of such delays.

6.4 NOTICE OF DELAY CLAIMS If the Trade Contractor believes it is due an equitable extension of Trade Contract Time or an equitable adjustment in Trade Contract Price as a result of a delay described in subsection 6.3.1, the Trade Contractor shall give the Owner and the Construction Manager written notice of the claim in accordance with section 8.4. If the Trade Contractor causes delay in the completion of the Trade Contract Work, the Owner shall be entitled to recover its additional costs subject to subsection 6.6. The Owner shall process any such claim against the Trade Contractor in accordance with ARTICLE 8.

6.5 LIQUIDATED DAMAGES

6.5.1 SUBSTANTIAL COMPLETION The Owner and the Trade Contractor agree that this Agreement ☐ shall / ☒ shall not (indicate one) provide for the imposition of liquidated damages based on the Date of Substantial Completion.

6.5.1.1 The Trade Contractor understands that if the Date of Substantial Completion established by this Agreement, as may be amended by subsequent Trade Change Order, is not attained, the Owner will suffer damages which are difficult to determine and accurately specify. The Trade Contractor agrees that if the Date of Substantial Completion is not attained the Trade Contractor shall pay the Owner Zero Dollars and No Cents (\$0.00) as liquidated damages and not as a penalty for each day that Substantial Completion extends beyond the Date of Substantial Completion. The liquidated damages provided herein shall be in lieu of all liability for any and all



extra costs, losses, expenses, claims, penalties and any other damages of whatsoever nature incurred by the Owner which are occasioned by any delay in achieving the Date of Substantial Completion.

6.5.2 FINAL COMPLETION The Owner and the Trade Contractor agree that this Agreement ☐ shall / ☒ shall not (indicate one) provide for the imposition of liquidated damages based on the Date of Final Completion.

6.5.2.1 The Trade Contractor understands that if the Date of Final Completion established by this Agreement, as may be amended by subsequent Trade Change Order is not attained, the Owner will suffer damages which are difficult to determine and accurately specify. The Trade Contractor agrees that if the Date of Final Completion is not attained the Trade Contractor shall pay the Owner Zero Dollars and No Cents (\$0.00) as liquidated damages and not as a penalty for each day that Final Completion extends beyond the Date of Final Completion. The liquidated damages provided herein shall be in lieu of all liability for any and all extra costs, losses, expenses, claims, penalties and any other damages of whatsoever nature incurred by the Owner which are occasioned by any delay in achieving the Date of Final Completion.

6.5.3 OTHER LIQUIDATED DAMAGES The Owner and the Trade Contractor may agree upon the imposition of liquidated damages based on other project milestones or performance requirements. Such agreement shall be included as an exhibit to this Agreement.

6.6 LIMITED MUTUAL WAIVER OF CONSEQUENTIAL DAMAGES Except for damages mutually agreed upon by the Parties as liquidated damages in Section 6.5 and excluding losses covered by insurance required by the Trade Contract Documents, the Owner and the Trade Contractor agree to waive all claims against each other for any consequential damages that may arise out of or relate to this Agreement, except for those specific items of damages excluded from this waiver as mutually agreed upon by the Parties and identified below. The Owner agrees to waive damages including but not limited to the Owner's loss of use of the Project, any rental expenses incurred, loss of income, profit or financing related to the Project, as well as the loss of business, loss of financing, principal office overhead and expenses, loss of profits not related to this Project, loss of reputation, or insolvency. The Trade Contractor agrees to waive damages including but not limited to loss of business, loss of financing, principal office overhead and expenses, loss of profits not related to this Project, loss of bonding capacity, loss of reputation, or insolvency. The provisions of this section shall also apply to the termination of this Agreement and shall survive such termination.

6.6.1 The following items of damages are excluded from this mutual waiver: The provisions of this section shall also apply to the termination of this Agreement and shall survive such termination. The Owner and the Trade Contractor shall require similar waivers in contracts with Subcontractors and Others retained for the Project.

ARTICLE 7 TRADE CONTRACT PRICE

7.1 LUMP SUM As full compensation for performance by the Trade Contractor of the Work in conformance with the Contract Documents, the Owner shall pay the Trade Contractor the lump sum price of: XX dollars and XX cents (\$XX.XX). The lump sum price is hereinafter referred to as the Trade Contract Price, which shall be subject to increase or decrease as provided in article 8.

Lump Sum Price includes Base Bid of \$X.XX and Alternate #XX for {alternate description} for \$X.XX for a total Lump Sum Price of \$X.XX.

7.2 ALLOWANCES

7.2.1 All allowances stated in the Trade Contract Documents shall be included in the Trade Contract Price. The Owner shall select allowance items in a timely manner so as not to delay the Trade Contract



Work.

7.2.2 Allowances shall include the costs of materials, supplies and equipment delivered to the Worksite, less applicable trade discounts and including requisite taxes, unloading and handling at the Worksite, and labor and installation, unless specifically stated otherwise. The Trade Contractor's Overhead and profit for the allowances shall be included in the Trade Contract Price, but not in the allowances. The Trade Contract Price shall be adjusted by Trade Contract Change Order to reflect the actual costs when they are greater than or less than the allowances.

ARTICLE 8 CHANGES

Changes in the Trade Contract Work that are within the general scope of this Agreement shall be accomplished, without invalidating this Agreement, by Trade Contract Change Order, and Trade Contract Interim Directed Change.

8.1 TRADE CHANGE ORDER

8.1.1 The Owner may order or the Trade Contractor may request changes in the Trade Contract Work or the timing or sequencing of the Trade Contract Work that impacts the Trade Contract Price or the Trade Contract Time. All such changes in the Trade Contract Work that affect Trade Contract Time or Trade Contract Price shall in the form of a Trade Contract Change Order. Any such requests for a change in the Trade Contract Price or the Trade Contract Time shall be processed in accordance with this article 8. Trade Contract Change Orders shall be executed on the ConsensusDOCS 813 - Trade Contract Change Order (CM as Owner's Agent) with attachments as necessary.

8.1.2 The Owner, with the assistance of the Construction Manager, and the Trade Contractor shall negotiate in good faith an appropriate adjustment to the Trade Contract Price or the Trade Contract Time and shall conclude these negotiations as expeditiously as possible. Acceptance of the Trade Contract Change Order and any adjustment in the Trade Contract Price or Trade Contract Time shall not be unreasonably withheld.

8.2 TRADE CONTRACT INTERIM DIRECTED CHANGE

8.2.1 The Construction Manager may issue a written Trade Contract Interim Directed Change signed by the Owner directing a change in the Trade Contract Work prior to reaching agreement with the Trade Contractor on the adjustment, if any, in the Trade Contract Price or the Trade Contract Time.

8.2.2 The Owner, with the assistance of the Construction Manager, and the Trade Contractor shall negotiate expeditiously and in good faith for appropriate adjustments, as applicable, to the Trade Contract Price or the Trade Contract Time arising out of a Trade Contract Interim Directed Change. As the Trade Contract Changed Work is performed, the Trade Contractor shall submit its costs for such work with its application for payment beginning with the next application for payment within thirty (30) Days of the issuance of the Trade Contract Interim Directed Change. If there is a dispute as to the cost to the Owner, the Trade Contractor shall continue to perform the Trade Contract Changed Work set forth in the Trade Contract Interim Directed Change and the Owner shall pay the requirements Trade Contractor the Cost of the Work, defined in 8.3.1.3 below upon receipt of an application for payment and the Owner's (and the Architect's and construction manger's) determination that the work has been completed. The Parties reserve their rights as to the disputed amount, subject to the requirements ARTICLE 12.

8.2.3 When the Owner and the Trade Contractor agree upon the adjustment in the Trade Contract Price or the Trade Contract Time, for a change in the Trade Contract Work directed by a Trade Contract Interim Directed Change, such agreement shall be the subject of a Trade Contract Change Order. The



Trade Contract Change Order shall include all outstanding Trade Contract Interim Directed Changes on which the Owner and Trade Contractor have reached agreement on Contract Price or Contract Time issued since the last Trade Contract Change Order.

8.3 DETERMINATION OF COST

8.3.1 An increase or decrease in the Trade Contract Price or the Trade Contract Time resulting from a change in the Trade Contract Work shall be determined by one or more of the following methods:

8.3.1.1 unit prices set forth in this Agreement or as subsequently agreed;

8.3.1.2 a mutually accepted, itemized lump sum;

8.3.1.3 COST OF THE WORK Cost of the Work as defined by this subsection plus 10.0 % for Overhead and 5.0 % for profit. "Cost of the Work" shall include the following costs reasonably incurred to perform a change in the Work

8.3.1.3.1 wages paid for labor in the direct employ of the Constructor in the performance of the Work;

8.3.1.3.2 salaries of the Trade Contractor's employees when stationed at the field office to the extent necessary to complete the applicable Work, employees engaged on the road expediting the production or transportation of material and equipment, and supervisory employees from the principal or branch office performing the functions listed below;

8.3.1.3.3 cost of applicable employee benefits and taxes, including but not limited to, workers' compensation, unemployment compensation, social security, health, welfare, retirement and other fringe benefits as required by law, labor agreements, or paid under the Trade Contractor's standard personnel policy, insofar as such costs are paid to employees of the Trade Contractor who are included in the Cost of the Work in subsections .1 and .2 immediately above;

8.3.1.3.4 reasonable transportation, travel, and hotel expenses of the Trade Contractor's personnel incurred in connection with the Work;

8.3.1.3.5 cost of all materials, supplies, and equipment incorporated in the Work, including costs of inspection and testing if not provided by the Owner, transportation, storage, and handling;

8.3.1.3.6 payments made by the Trade Contractor to Subcontractors for Work performed under this Agreement;

8.3.1.3.7 cost, including transportation and maintenance of all materials, supplies, equipment, temporary facilities, and hand tools not owned by the workers that are used or consumed in the performance of the Work, less salvage value or residual value; and cost less salvage value of such items used, but not consumed that remain the property of the Trade Contractor;

8.3.1.3.8 rental charges of all necessary machinery and equipment, exclusive of hand tools owned by workers, used at the Worksite, whether rented from the Trade Contractor or Others, including installation, repair and replacement, dismantling, removal, maintenance, transportation, and delivery costs. Rental from unrelated third parties shall be reimbursed at actual cost. Rentals from the Trade Contractor or its affiliates, subsidiaries, or related parties shall be reimbursed at the prevailing rates in the locality of the Worksite up to eighty-five percent (85%) of the value of the piece of equipment;

8.3.1.3.9 cost of the premiums for all insurance and surety bonds which the Trade Contractor is



required to procure or deems necessary, and approved by the Owner including any additional premium incurred as a result of any increase in the cost of the Work;

8.3.1.3.10 sales, use, gross receipts or other taxes, tariffs, or duties related to the Work for which the Trade Contractor is liable;

8.3.1.3.11 permits, fees, licenses, tests, and royalties;

8.3.1.3.12 reproduction costs, photographs, facsimile transmissions, long-distance telephone calls, data processing costs and services, postage, express delivery charges, data transmission, telephone service, and computer-related costs at the Worksite to the extent such items are used and consumed in the performance of the Work or are not capable of use after completion of the Work;

8.3.1.3.13 all water, power, and fuel costs necessary for the Work;

8.3.1.3.14 cost of removal of all nonhazardous substances, debris, and waste materials;

8.3.1.3.15 all costs directly incurred to perform a change in the Work which are reasonably inferable from the Contract Documents for the Changed Work;

8.3.1.3.16 DISCOUNTS All discounts for prompt payment shall accrue to the Owner to the extent such payments are made directly by the Owner. To the extent payments are made with funds of the Constructor, all cash discounts shall accrue to the Constructor. All trade discounts, rebates and refunds, and all returns from sale of surplus materials and equipment, shall be credited to the Cost of the Work;

8.3.1.3.17 COST REPORTING The Trade Contractor shall maintain in conformance with generally accepted accounting principles a complete and current set of records that are prepared or used by the Trade Contractor to calculate the Cost of Work. The Owner and Construction Manager shall be afforded access to the Trade Contractor's records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda and similar data relating to requested payment for Cost of the Work. The Trade Contractor shall preserve all such records for a period of three years after the final payment or longer where required by law;

8.3.1.3.18 COST AND SCHEDULE ESTIMATES The Trade Contractor shall use reasonable skill and judgment in the preparation of a cost estimate or schedule for a change to the Work, but does not warrant or guarantee their accuracy

8.3.1.4 If an increase or decrease cannot be agreed to as set forth in Clauses .1 through .3 above, and the Owner or the Construction Manager issues a Trade Contract Interim Directed Change, the cost of the change in the Trade Contract Work shall be determined by the reasonable actual expense and savings of the performance of the Work resulting from the change. If there is a net increase in the Trade Contract Price, the Trade Contractor's Fee shall be adjusted accordingly. In case of a net decrease in the Trade Contract Price, the Trade Contractor's Fee shall not be adjusted unless ten percent (10%) or more of the Project is deleted. The Trade Contractor shall maintain a documented, itemized accounting evidencing the expenses and savings.

8.3.2 If unit prices are set forth in the Trade Contract Documents or are subsequently agreed to by the Parties, but the character or quantity of such unit items as originally contemplated is so different in a proposed Trade Change Order that the original unit prices will cause substantial inequity to the Owner or the Trade Contractor, such unit prices shall be equitably adjusted.

8.4 CLAIMS FOR ADDITIONAL COST OR TIME Except as provided in subsection 6.3.2 and section 6.4 for



any claim for an increase in the Trade Contract Price or the Trade Contract Time, the Trade Contractor shall give the Owner and the Construction Manager written notice of the claim within fourteen (14) Days after the occurrence giving rise to the claim or within fourteen (14) Days after the Trade Contractor first recognizes (or should have recognized) the condition giving rise to the claim, whichever is later. Except in an emergency, notice shall be given before proceeding with the Trade Contract Work. Thereafter, the Trade Contractor shall submit written documentation of its claim, including appropriate supporting documentation, within twenty-one (21) Days after giving notice, unless the Parties mutually agree upon a period of time. The Owner or Construction Manager shall respond in writing denying or approving the Trade Contractor's claim no later than fourteen (14) Days after receipt of the Trade Contractor's claim. Any change in the Trade Contract Price or the Trade Contract Time resulting from such claim shall be authorized by Trade Contract Change Order.

ARTICLE 9 PAYMENT

9.1 GENERAL PROVISIONS Within fourteen (14) calendar Days from the date of execution of this Agreement, the Trade Contractor shall prepare and submit to the Construction Manager for approval a Schedule of Values apportioned to the various divisions or phases of the Trade Contract Work. Each line item contained in the Schedule of Values shall be assigned a monetary price such that the total of all such items shall equal the Trade Contract Price. The Schedule of Values shall be prepared in such detail and be supported by such documents and proof as may be required by the Construction Manager.

9.2 PROGRESS PAYMENTS

9.2.1 APPLICATIONS The Trade Contractor shall submit to the Construction Manager monthly notarized applications for payment. Trade Contractor's applications for payment shall be itemized and supported by the Trade Contractor's Schedule of Values and any other substantiating data as required by this Trade Contractor Agreement or requested by the Construction Manager or Design Professional. Payment applications may include payment requests on account of properly authorized Trade Contract Change Orders and Interim Directed Changes. The progress payment application shall include Trade Contract Work performed through the preceding calendar month. The Construction Manager will review the application and recommend to the Design professional and the Owner amounts payable by the Owner to the Trade Contractor. The Owner, in accordance with the determination of the Design Professional, shall pay the amount otherwise due on any payment application, less any amounts as set forth below, no later than thirty (30) calendar Days after the payment application, or portion thereof, is approved the Design Professional. The Owner may deduct, from any progress payment, such amounts as may be retained pursuant to subsection 9.2.4 below.

9.2.2 STORED MATERIALS AND EQUIPMENT Unless otherwise provided in the contract documents, applications for payment may include materials and equipment not yet incorporated into the Work but delivered to and suitably stored onsite or offsite including applicable insurance, storage and costs incurred transporting the materials to an offsite storage facility. Approval of payment applications for stored materials and equipment stored offsite shall be conditioned on submission by the Trade Contractor of bills of sale and proof of required insurance, or such other procedures satisfactory to the Owner to establish the proper valuation of the stored materials and equipment, the Owner's title to such materials and equipment, and to otherwise protect the Owner's interests therein, including transportation to the site.

9.2.3 CLAIM WAIVERS

9.2.3.1 PARTIAL CLAIMWAIVERS AND AFFIDAVITS As a prerequisite for payment, the Trade Contractor shall provide, in a form satisfactory to the Owner and the Construction Manager, partial claim waivers in the amount of the application for payment and affidavits from the Trade Contractor, and its Subcontractors, Material Suppliers for the completed Trade Contract Work.



Such waivers shall be effective upon payment. In no event shall the Trade Contractor be required to sign an unconditional waiver of claim, either partial or final, prior to receiving payment or in an amount in excess of what it has been paid.

9.2.4 RETAINAGE From each progress payment made to the Trade Contractor has the Owner shall retain FIVE (5) percent of the amount otherwise due after deduction of any amounts as provided in section 9.3 and in no event shall such percentage exceed any applicable statutory requirements of this Agreement. Retainage shall be withheld and administered in accordance with Iowa Code Chapter 572:

9.3 ADJUSTMENT OF TRADE CONTRACTOR'S PAYMENT APPLICATION The Owner or the Construction Manager, upon notification of the Design Professional, may reject or adjust a Trade Contractor payment application or nullify a previously approved Trade Contractor payment application, in whole or in part, as may reasonably be necessary to protect the Owner from loss or damage based upon the following, to the extent that the Trade Contractor is responsible therefor under this Trade Contractor Agreement:

9.3.1 the Trade Contractor's repeated failure to perform the Trade Contract Work as required by the Trade Contractor Agreement;

9.3.2 loss or damage arising out of or relating to the Trade Contractor Agreement and caused by the Trade Contractor to the Owner, or to the Construction Manager or others to whom the Owner may be liable;

9.3.3 the Trade Contractor's failure to properly pay for labor, materials, equipment or supplies furnished in connection with the Trade Contract Work;

9.3.4 nonconforming or defective Trade Contract Work which has not been corrected in a timely fashion;

9.3.5 reasonable evidence of delay in performance of the Trade Contract Work such that the work will not be completed within the Trade Contract Time, and that the unpaid balance of the Trade Contract Price is not sufficient to offset any liquidated damages or actual damages that may be sustained by the Owner as a result of the anticipated delay caused by the Trade Contractor;

9.3.6 reasonable evidence demonstrating that the unpaid balance of the Trade Contract Price is insufficient to cover the cost to complete the Trade Contract Work; and

9.3.7 third-party claims involving the Trade Contractor or reasonable evidence demonstrating that third-party claims are likely to be filed unless and until the Trade Contractor furnishes the Owner with adequate security in the form of a surety bond, letter of credit or other collateral or commitment which are sufficient to discharge such claims if established. No later than thirty (30) Days after receipt of an application for payment, the Owner or Construction Manager shall give written notice to the Trade Contractor, disapproving or nullifying it or a portion thereof, specifying the reasons for the disapproval or nullification. When the above reasons for disapproving or nullifying an application for payment are removed, payment will be made for amounts previously withheld.

9.4 PAYMENT NOT ACCEPTANCE Payment to the Trade Contractor does not constitute or imply acceptance of any portion of the Trade Contract Work.

9.5 PAYMENT DELAY If for any reason not the fault of the Trade Contractor, the Trade Contractor does not receive a progress payment from the Owner sixty (60) calendar Days after the time such payment is due, as defined in Subparagraph 9.2.1, then the Trade Contractor, upon giving within seven (7) calendar Days after written notice to the Owner, and without prejudice to and in addition to any other legal remedies, may stop its Trade Contract Work until payment of the full amount owing to the Trade Contractor has been received. The



Trade Contract Price and Trade Contract Time shall be equitably adjusted by a Trade Contract Change Order to reflect reasonable cost and delay resulting from shutdown, delay and start-up.

9.6 SUBSTANTIAL COMPLETION

9.6.1 The Trade Contractor shall notify the Owner, the Construction Manager and the Design Professional when it considers Substantial Completion of the Trade Contract Work or a designated portion to have been achieved. The Construction Manager and the Design Professional shall promptly conduct an inspection to determine whether the Trade Contract Work or designated portion can be occupied or utilized for its intended use by the Owner without excessive interference in completing any remaining unfinished Trade Contract Work by the Trade Contractor. If the Construction Manager and the Design Professional determine that the Trade Contract Work or designated portion has not reached Substantial Completion, the Design Professional, and the Construction Manager, shall promptly compile a list of items to be completed or corrected so the Owner may occupy or utilize the Trade Contract Work or designated portion for its intended use. The Trade Contractor shall promptly complete all items on the list.

9.6.2 When Substantial Completion of the Trade Contract Work or a designated portion is achieved, the Construction Manager and the Design Professional shall prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, and the respective responsibilities of the Owner and Trade Contractor for interim items such as security, maintenance, utilities, insurance and damage to the Trade Contract Work. The Owner shall assume all responsibilities for items such as security, maintenance, utilities, and insurance, and damage to the Work. The certificate shall also list the items to be completed or corrected, and establish the time for their completion or correction. The Certificate of Substantial Completion shall be submitted to the Trade Contractor for written acceptance of responsibilities assigned in the Certificate.

9.6.3 Unless otherwise provided in the Certificate of Substantial Completion, warranties required by the Trade Contract Documents shall commence on the date of Substantial Completion of the Trade Contract Work or a designated portion.

9.6.4 Uncompleted items shall be completed by the Trade Contractor by the Final Completion date set forth in the Agreement and/or Construction Schedule. The Trade Contractor may request early release of retainage in accordance with Iowa Code Section 26.13. Payment for completed work and retainage shall be made in accordance with Iowa Code Chapters 26 and 573.

9.7 PARTIAL OCCUPANCY OR USE The Owner may occupy or use completed or partially completed portions of the Trade Contract Work when (a) the portion of the Trade Contract Work is designated in a Certificate of Substantial Completion, (b) appropriate insurer(s) consent to the occupancy or use, and (c) appropriate public authorities authorize the occupancy or use. Such partial occupancy or use shall constitute Substantial Completion of that portion of the Trade Contract Work.

9.8 FINAL PAYMENT

9.8.1 APPLICATION Upon acceptance of the Trade Contract Work by the Construction Manager, and approval by the Design Professional, and upon the Trade Contractor furnishing evidence of fulfillment of the Trade Contractor's obligations in accordance with the Trade Contract Documents, the Trade Contractor shall submit its application for final payment. The Construction Manager will review the Trade Contractor's final payment application and recommend to the Design Professional and the Owner an amount payable by the Owner to the Trade Contractor. The Design Professional shall then recommend an amount to be paid by the Owner. Final payment shall be made in accordance with Iowa Code Chapters 26 and 573.



9.8.2 REQUIREMENTS Along with its application for final payment, the Trade Contractor shall furnish to the Construction Manager:

9.8.2.1 an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Trade Contract Work for which the Owner or its property or the Construction Manager or the Owner's surety might in any way be liable, have been paid or otherwise satisfied;

9.8.2.2 consent of the Trade Contractor's surety to final payment;

9.8.2.3 satisfaction of closeout procedures as may be required by the Trade Contractor Agreement;

9.8.2.4 certification (or other writing indicating) that insurance required by the Trade Contractor Agreement is and will remain in effect beyond final payment pursuant to this Trade Contractor Agreement and

9.8.2.5 other data if required by the Owner or Construction Manager, such as receipts, releases, and waivers of liens effective upon payment to the extent and in such form as may be designated by the Owner or Construction Manager. Acceptance of final payment by the Trade Contractor shall constitute a waiver of all claims by the Trade Contractor except those previously made in writing and identified by the Trade Contractor as unsettled at the time of final application for payment.

9.8.3 TIME OF PAYMENT Final payment of the balance of the Trade Contract Price, less any amount retained pursuant to subsection 9.2.4 of this Agreement, and as required by Iowa Code Chapters 26 and 573, which among other things requires that twice the amount of an Iowa Code Chapter 573 subcontractor claim be withheld from final payment, shall be made to the Trade contractor within sixty (60) Days after the Trade Contractor has submitted a complete and accurate application for final payment.

9.8.4 LATE PAYMENT INTEREST Progress payments or final payment due and unpaid under this Trade Contractor Agreement shall bear interest from the date payment is due at the statutory rate prevailing at the place of the Project.

9.9 PAYMENT USE AND VERIFICATION The Trade Contractor is required to pay for all labor, materials and equipment used in the performance of the Trade Contract Work through the most current period applicable to progress payments received. Reasonable evidence, satisfactory to the Construction Manager, may be required to show that all obligations relating to the Trade Contract Work are current before releasing any payment due on the Trade Contract Work. If required by the Construction Manager, before final payment is made for the Trade Contract Work, the Trade Contractor shall submit evidence satisfactory to the Construction Manager that all payrolls, bills for materials and equipment, and all known indebtedness connected with the Trade Contract Work, have been paid or otherwise satisfied as set forth in subsection 9.8.2.

ARTICLE 10 INDEMNITY, INSURANCE, WAIVERS AND BONDS

10.1 INDEMNITY

10.1A To the extent portions of this Article are in conflict with SF 396 (codified at Iowa Code Section 573A.5) said portions are void and unenforceable.

10.1.1 TRADE CONTRACTOR'S INDEMNITY To the fullest extent permitted by law, the Trade Contractor shall indemnify and hold harmless the Owner, the Owner's officers, directors, members,



consultants, agents and employees, from all claims for bodily injury and property damage, other than to the Work itself and other property insured under subsection 10.3.1, including reasonable attorneys' fees, costs and expenses, that may arise from the performance of the Work, but only to the extent caused by the negligent acts or omissions of the Trade Contractor, Subcontractors or anyone employed directly or indirectly by any of them or by anyone for whose acts any of them may be liable. The Trade Contractor shall be entitled to reimbursement of any defense costs paid above the Trade Contractor's percentage of liability for the underlying claim to the extent provided for under subsection 10.1.2.

10.1.2 OWNER'S INDEMNITY To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Trade Contractor, its officers, directors, members, consultants, agents, and employees, from all claims for bodily injury and property damage, other than property insured under subsection 10.3.1, including reasonable attorneys' fees, costs and expenses, that may arise from the performance of work by Owner, Design Professional or Others, but only to the extent caused by the negligent acts or omissions of the Owner, Design Professional or Others. The Owner shall be entitled to reimbursement of any defense costs paid above Owner's percentage of liability for the underlying claim to the extent provided for under subsection 10.1.1.

10.1.3 CONSTRUCTION MANAGER AND DESIGN PROFESSIONAL INDEMNITY The Owner shall cause the Construction Manager and the Design Professional to agree to indemnify and hold harmless the Owner from all claims for bodily injury and property damage, other than to the Work itself and other property insured under section 10.3, that may arise from the Construction Manager's or the Design Professional's services, but only to the extent that such claims result from the negligent acts or omissions of the Construction Manager or the Design Professional, respectively, or anyone for whose acts or omissions the Construction Manager or Design Professional, respectively, is liable. Such provisions shall be in a form no less protective of the Parties than the Construction Manager's Indemnity provided in ConsensusDocs 801 (2011) or the Design Professional's indemnity provided in ConsensusDocs 803 (2011) respectively, and shall be reasonably satisfactory to the Owner and the Trade Contractor.

10.1.4 ADJACENT PROPERTY INDEMNIFICATION To the extent of the limits of Trade Contractor's Commercial General Liability Insurance specified in subsection 10.2.1 or Zero Dollars and No Cents (\$0.00) whichever is more, the Trade Contractor shall indemnify and hold harmless the Owner against any and all liability, claims, demands, damages, losses and expenses, including attorney's fees, in connection with or arising out of any damage or alleged damage to any of Owner's existing adjacent property that may arise from the performance of the Trade Contract Work, but only to the extent of the negligent acts or omissions of the Trade Contractor, Subcontractor or anyone employed directly or indirectly by any of them or by anyone for whose acts any of them may be liable.

10.1.5 NO LIMITATION ON LIABILITY In any and all claims against the Indemnitees by any employee of the Trade Contractor, anyone directly or indirectly employed by the Trade Contractor or anyone for whose acts the Trade Contractor may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Trade Contractor under Workers' Compensation acts, disability benefit acts or other employment benefit acts.

10.2 TRADE CONTRACTOR'S INSURANCE

10.2.1 Prior to the start of the Work, the Trade Contractor shall procure and maintain in force Workers Compensation/Employers' Liability Insurance, Business Automobile Liability Insurance, and Commercial General Liability Insurance (CGL). The CGL policy shall include coverage for liability arising from premises, operations, independent contractors, products-completed operations, personal injury and



advertising injury, contractual liability, and broad form property damage. The Trade Contractor's liability policies, as required in this Subparagraph 10.2.1, shall be written on an occurrence basis with at least the following limits of liability:

10.2.1.1 Workers' Compensation- amount required by the laws of Iowa

10.2.1.2 Employers' Liability Insurance - \$500,000 or an amount required by Iowa law, whichever is greater.

10.2.1.3 Business Automobile Liability Insurance

a. \$1,000,000 Each Accident

10.2.1.4 Commercial General Liability Insurance

a. \$1,000,000 Each Occurrence b. \$2,000,000 General Aggregate c. \$1,000,000

Products/Completed Operations Aggregate d. \$1,000,000 Personal and Advertising Injury Limit

10.2.2 The Trade Contractor Must also carry and maintain Excess or Umbrella Liability coverage for the policies in subsection 10.2.1 in the amounts as listed below:

Trade Contractor Contract Amount: <\$1,000,000 - \$2 Million Umbrella or more \$1,000,000 - \$5,000,000 - \$5 Million Umbrella or more >\$5,000,000 - \$10 Million Umbrella or more

10.2.3 The Trade Contractor shall maintain in effect all insurance coverage required under subsection 10.2.1 with insurance companies lawfully authorized to do business in Iowa. Such insurance companies shall have a minimum A.M. Best Rating of A-VI (Consult instructions and insurance advisor). If the Trade Contractor fails to obtain or maintain any insurance coverage required under this Agreement, the Owner may purchase such coverage and charge the expense to the Trade Contractor, or terminate this Agreement.

10.2.4 To the extent commercially available, the policies of insurance required under Subparagraph 10.2.1 shall contain a provision that the insurance company or its designee must give the Owner written notice transmitted in paper or electronic format: (a) 30 days before coverage is nonrenewed by the insurance company and (b) with 10 business days after cancelation of coverage by the insurance company. The Trade Contractor shall maintain completed operations liability insurance for one year after acceptance of the Contract Documents, whichever is longer. Prior to commencement of services, the Trade Contractor shall furnish the Owner with certificates evidencing the required coverages. In addition, if any insurance policy required under subsection 10.2.1 is not to be immediately replaced without a lapse in coverage when it expires, exhausts its limits, or is to be, cancelled, the Trade Contractor shall give Owner prompt written notice upon actual or constructive knowledge of such condition.

10.2.5 ADDITIONAL LIABILITY COVERAGE

10.2.5.1 The Owner ☒ shall / ☐ shall not (indicate one) require the Trade Contractor to purchase and maintain liability coverage, primary to the Owner's coverage under subsection 10.3.1.

10.2.5.2 If required by subsection 10.2.5.1, the additional liability coverage required of the Trade Contractor shall be:

1. Additional Insured Owner shall be named as an additional insured on Trade Contractor's Commercial General Liability Insurance specified for operations and completed operations,



but only with respect to liability for bodily injury, property damage or personal and advertising injury to the extent caused by the negligent acts or omissions of Trade Contractor, or those acting on Trade Contractor's behalf, in the performance of Trade Contractor's Work for.

2. OCP Trade Contractor shall provide an Owners' and Contractors' Protective Liability Insurance ("OCP") policy with limits equal to the limits on Commercial General Liability Insurance specified or limits as otherwise required by Owner.

Any documented additional cost in the form of a surcharge associated with procuring the additional liability coverage in accordance with this subsection shall be paid by the Owner directly or the costs may be reimbursed by the Owner to the Trade Contractor by increasing the Trade Contract Price to correspond to the actual cost required to purchase and maintain the additional liability coverage. Prior to commencement of the Work, the Trade Contractor shall obtain and furnish to the Owner a certificate evidencing that the additional liability coverages have been procured.

10.2.6 PROFESSIONAL LIABILITY INSURANCE To the extent the Trade Contractor is required to procure design services under this Agreement, in accordance with section 3.14, the Trade Contractor shall require the designers to obtain professional liability insurance for claims arising from the negligent performance of professional services under this Agreement, with a company reasonably satisfactory to the Owner, including coverage for all professional liability caused by any of the Designer's(s') consultants, written for not less than \$1,000,000 per claim and in the aggregate with the deductible not to exceed \$2,000,000. The deductible shall be paid by the Designer.

10.3 OWNER'S INSURANCE

10.3.1 Deleted.

10.3.2 Deleted.

10.4 PROPERTY INSURANCE

10.4.1 Before the start of Trade Contract Work, the Owner shall obtain and maintain Builder's Risk Policy insurance with minimum coverage limits equal to the full cost of replacement of the Project at the time of loss. This insurance shall also name the Trade Contractor, Subcontractors, Material Suppliers, Construction Manager and Design Professional as insureds. This insurance shall be written as a Builder's Risk Policy or equivalent form to cover all risks of physical loss except those specifically excluded by the policy, and shall insure at least against the perils of fire, lightning, explosion, windstorm, hail, smoke, aircraft and vehicles, riot and civil commotion, theft, vandalism, malicious mischief, debris removal, flood (subject to sublimits), earthquake (subject to sublimits), earth movement, water damage, wind damage, testing if applicable, collapse however caused, and shall include coverage for, material, or equipment stored offsite, onsite or in transit. This policy shall provide for a waiver of subrogation in favor of the Trade Contractor, Subcontractors, Material Suppliers, Construction Manager and Design Professional. This insurance shall remain in effect until the Substantial Completion of the Work, final payment has been made or until no person or entity other than the Owner has an insurable interest in the property to be covered by this insurance, whichever is sooner. Partial occupancy or use of the Work shall not commence until the Owner has secured the consent of the insurance company or companies providing the coverage required in this Subparagraph 10.4.1.

10.4.2 If the Owner does not intend to purchase the property insurance required by this Agreement, including all of the coverages and deductibles described herein, the Owner shall give written notice to the Trade Contractor, the Design Professional and the Construction Manager before the Trade Contract



Work is commenced. The Trade Contractor may then provide insurance to protect its interests and the interests of the Subcontractors, including the coverage of deductibles. The cost of this insurance shall be charged to the Owner in a Change Order. The Owner shall be responsible for all of Trade Contractor's costs reasonably attributed to the Owner's failure or neglect in purchasing or maintaining the coverage described above.

10.4.2.1 The Owner will not obtain insurance to cover the risk of physical loss resulting from Terrorism. The Construction Manager is not required to purchase this type of insurance but may purchase this type of insurance if it chooses. If purchased, the cost of this insurance shall be borne by the Construction manager.

10.4.3 POLICIES The Owner shall provide the Trade Contractor with a copy of all policies including all endorsements upon request.

10.5 PROPERTY INSURANCE LOSS ADJUSTMENT

10.5.1 LOSS ADJUSTMENT Any insured loss shall be adjusted with the Owner and the Trade Contractor and made payable to the Owner as trustee for the insureds, as their interests may appear.

10.5.2 DISTRIBUTION OF PROCEEDS Following the occurrence of an insured loss, monies received will be deposited in a separate account and the trustee shall make distribution in accordance with the agreement of the Parties in interest.

10.6 WAIVERS

10.6.1 PROPERTY DAMAGE The Owner and Trade Contractor waive all claims and other rights they may have against each other for loss of or damage to (a) the Project, (b) all materials, machinery, equipment and other items used in accomplishing the Trade Contract Work or services or to be incorporated into the Project, while the same are in transit, at the Project Site, during erection and otherwise, and (c) all property owned by or in the custody of Owner and its affiliates, however such loss or damage shall occur, to the extent such damage is covered by property insurance. The proceeds of such insurance shall be held by the Owner as trustee.

10.6.2 WAIVER OF SUBROGATION The Owner shall have its insurers waive all rights of subrogation they may have against the Construction Manager, Design Professional, Trade Contractors, and their Subcontractors and Material Suppliers on all policies carried by the Owner on the Project and adjacent properties, including, after final payment, those policies to be provided on the completed Project not intended to insure the Project during construction.

10.6.3 ENDORSEMENT If the policies of insurance referred to in this section require an endorsement to provide for continued coverage where there is a waiver of subrogation, the Owner will cause them to be so endorsed.

10.7 RISK OF LOSS Except to the extent a loss is covered by property insurance carried by the owner, risk of loss or damage to the Work shall be upon the Trade Contractor until the Date of Final Completion, unless otherwise agreed to by the Parties.

10.8 BONDS Performance and Payment Bonds

☒ are

☐ are not

required of the Trade Contractor that meet the requirements of Iowa Code Chapter 573. A deposit in lieu of a



bond may be acceptable if it meets the requirements of Iowa Code Section 573.4. Such bonds shall be issued by a surety admitted in the State in which the Project is located and must be acceptable to the Owner. The Owner's acceptance shall not be withheld without reasonable cause. The penal sum of the Payment Bond and of the Performance Bond shall each be one hundred percent (100%) of the original Contract Price. Any increase in the Contract Price that exceeds ten percent (10%) in the aggregate shall require a rider to the Bonds increasing penal sums accordingly. Up to such ten percent (10%) amount, the penal sum of the Bond shall remain equal to one hundred percent (100%) of the Contract Price. The Trade Contractor shall endeavor to keep its surety advised of changes potentially impacting the Contract Time and Contract Price, though the Trade Contractor shall require that its surety waives any requirement to be notified of any alteration or extension of time. The Trade Contractor's Payment Bond for the Project, if any, shall be made available by the Owner for review and copying by the Subcontractor. Iowa Code Chapter 573 shall control and take precedence over any conflicting term or condition in this Agreement

ARTICLE 11 SUSPENSION, NOTICE TO CURE AND TERMINATION OF AGREEMENT

11.1 SUSPENSION BY OWNER FOR CONVENIENCE

11.1.1 OWNER SUSPENSION Should the Owner order the Trade Contractor in writing to suspend, delay, or interrupt the performance of the Trade Contract Work for such period of time as may be determined to be appropriate for the convenience of the Owner and not due to any act or omission of the Trade Contractor or any person or entity for whose acts or omissions the Trade Contractor may be liable, then the Trade Contractor shall immediately suspend, delay or interrupt that portion of the Trade Contract Work as ordered by the Owner. The Trade Contract Price and the Trade Contract Time shall be equitably adjusted by Trade Contract Change Order for the cost and delay resulting from any such suspension.

11.1.2 Any action taken by the Owner that is permitted by any other provision of the Trade Contract Documents and that results in a suspension of part or all of the Trade Contract Work does not constitute a suspension of Trade Contract Work under this section.

11.2 NOTICE TO CURE A DEFAULT If the Trade Contractor persistently refuses or fails to supply enough properly skilled workers, proper materials, or equipment to maintain the approved Construction Schedule in accordance with ARTICLE 6, or fails to make prompt payment to its workers, Subcontractors or Material Suppliers; disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction; or is otherwise guilty of a material breach of a provision of this Agreement, the Trade Contractor may be deemed in default. If the Trade Contractor fails within seven (7) business Days after receipt of written notification to commence and continue satisfactory correction of such default with diligence and promptness, then the Owner shall give the Trade Contractor a second notice to correct the default within a three (3) Day period. If the Trade Contractor fails to promptly commence and continue satisfactory correction of the default following receipt of such second notice, the Owner without prejudice to any other rights or remedies may:

11.2.1 supply workers and materials, equipment and other facilities as the Owner or Construction Manager deems necessary for the satisfactory correction of the default, and charge the cost to the Trade Contractor, who shall be liable for the payment of same including reasonable Overhead, profit and attorneys' fees;

11.2.2 contract with Others to perform such part of the Trade Contract Work as the Owner or Construction Manager determines shall provide the most expeditious correction of the default, and charge the cost to the Trade Contractor;

11.2.3 withhold payment due the Trade Contractor in accordance with section 9.3; and

11.2.4 in the event of an emergency affecting the safety of persons or property, immediately commence



and continue satisfactory correction of such default as provided in subsections 11.2.1 and 11.2.2 without first giving written notice to the Trade Contractor, but shall give prompt written notice of such action to the Trade Contractor following commencement of the action.

11.3 OWNER'S RIGHT TO TERMINATE FOR DEFAULT

11.3.1 **TERMINATION BY OWNER FOR DEFAULT** If, within seven (7) Days of receipt of a notice to cure pursuant to section 11.2, the Trade Contractor fails to commence and satisfactorily continue correction of the default set forth in the notice to cure, the Owner may notify the Trade Contractor that it intends to terminate this Agreement for default absent appropriate corrective action within fourteen additional Days. After the expiration of the additional fourteen (14) Day period, the Owner may terminate this Agreement by written notice absent appropriate corrective action. Termination for default is in addition to any other remedies available to Owner under section 11.2. If the Owner's cost arising out of the Trade Contractor's failure to cure, including the cost of completing the Trade Contract Work and reasonable attorneys' fees, exceeds the unpaid Trade Contract Price, the Trade Contractor shall be liable to the Owner for such excess costs. If the Owner's costs are less than the unpaid Trade Contract Price, the Owner shall pay the difference to the Trade Contractor. In the event the Owner exercises its rights under this section, upon the request of the Trade Contractor the Owner shall furnish to the Trade Contractor a detailed accounting of the cost incurred by the Owner.

11.3.2 **USE OF TRADE CONTRACTOR'S MATERIALS, SUPPLIES AND EQUIPMENT** If the Owner or Others perform work under this section, the Owner shall have the right to take and use any materials, supplies and equipment belonging to the Trade Contractor and located at the Worksite for the purpose of completing any remaining Trade Contract Work. Immediately upon completion of the Work, any remaining materials, supplies or equipment not consumed or incorporated in the Trade Contract Work shall be returned to the Trade Contractor in substantially the same condition as when they were taken, reasonable wear and tear excepted.

11.3.3 If the Trade Contractor files a petition under the Bankruptcy Code, this Agreement may be terminated for cause at the may be terminated for cause at the Owner.

11.3.3 If the Trade Contractor files a petition under the Bankruptcy Code, this Agreement may be terminated for cause at the may be terminated for cause at the Owner.

11.3.4 The Owner shall make reasonable efforts to mitigate damages arising from Trade Contractor default, and shall promptly invoice the Trade Contractor for all amounts due pursuant to sections 11.2 and 11.3.

11.4 TERMINATION BY OWNER FOR CONVENIENCE

11.4.1 Upon written notice to the Trade Contractor, the Owner may, without cause, terminate this Agreement. The Trade Contractor shall immediately stop the Work, follow the Owner's or Construction Manager's instructions regarding shutdown and termination procedures, and strive to minimize any further costs.

11.4.2 If the Owner terminates this Agreement pursuant to this section, the Trade Contractor shall be paid:

11.4.2.1 for the Work performed to date including Overhead and profit; and

11.4.2.2 for all demobilization costs and costs incurred as a result of the termination but not including Overhead or profit on work not performed;

11.4.2A Upon written notice to the Trade Contractor the Owner has the right to terminate this



Agreement without penalty as a result of the following: 1) the legislature or governor fail to appropriate funds sufficient to allow the Owner to operate as required and fulfill its obligations under this Agreement, 2) funds are de-appropriated or not allocated, 3) the Owner's authorization to operate is withdrawn or there is a material alteration in the programs administered by the owner, or 4) the Owner's duties are substantially modified. If such a termination results then the Trade Contractor shall be paid in the manner set forth in subparagraph 11.4.2. If, however, an appropriation to cover the cost of this Agreement becomes available within sixty (60) days subsequent to termination under this paragraph then the Owner agrees to re-enter into a modified version of this Agreement that accounts for the termination and reinstatement.

11.4.3 If the Owner terminates this Agreement pursuant to sections 11.3 or 11.4, the Trade Contractor shall:

11.4.3 If the Owner terminates this Agreement pursuant to sections 11.3 or 11.4, the Trade Contractor shall:

11.4.3.1 execute and deliver to the Owner all papers and take all action required to assign, transfer and vest in the Owner the rights of the Trade Contractor to all materials, supplies and equipment for which payment has or will be made in accordance with the Trade Contract Documents and all subcontracts, orders and commitments which have been made in accordance with the Trade Contract Documents;

11.4.3.2 exert reasonable effort to reduce to a minimum the Owner's liability for subcontracts, orders and commitments that have not been fulfilled at the time of the termination;

11.4.3.3 cancel any subcontracts, orders and commitments as the Owner or Construction Manager directs; and

11.4.3.4 sell at prices approved by the Owner or Construction Manager any materials, supplies and equipment as the Owner or Construction Manager directs, with all proceeds paid or credited to the Owner.

11.5 TRADE CONTRACTOR'S RIGHT TO TERMINATE

11.5.1 Upon seven (7) Days' written notice to the Owner and Construction Manager, the Trade Contractor may terminate this Agreement if the Trade Contract Work has been stopped for a thirty (30) Day period through no fault of the Trade Contractor for any of the following reasons:

11.5.1.1 under court order or order of other governmental authorities having jurisdiction;

11.5.1.2 as a result of the declaration of a national emergency or other governmental act during which, through no act or fault of the Trade Contractor, materials are not available; or

11.5.1.3 suspension by the Owner for convenience pursuant to section 11.1

11.5.2 In addition, upon seven (7) Days' written notice to the Owner and Construction Manager, the Trade Contractor may terminate the Agreement if the Owner:

11.5.2.1 fails to furnish reasonable evidence pursuant to section 4.1.2 that sufficient funds are available and committed for Project financing, or

11.5.2.2 assigns this Agreement over the Trade Contractor's reasonable objection, or

11.5.2.3 fails to pay the Trade Contractor in accordance with this Agreement and the Trade Contractor has complied with the notice provisions of section 9.5, or



11.5.2.4 otherwise materially breaches this Agreement.

11.5.3 Upon termination by the Trade Contractor in accordance with this section, the Trade Contractor shall be entitled to recover from the Owner payment for all Trade Contract Work executed and for any proven loss, cost or expense in connection with the Trade Contract Work, including all demobilization costs plus reasonable Overhead and profit on work not performed.

11.6 OBLIGATIONS ARISING BEFORE TERMINATION Even after termination pursuant to ARTICLE 11, the provisions of this Agreement still apply to any Trade Contract Work performed, payments made, events occurring, costs charged or incurred or obligations arising before the termination date.

ARTICLE 12 DISPUTE MITIGATION AND RESOLUTION

12.1 WORK CONTINUANCE AND PAYMENT Unless otherwise agreed in writing, the Trade Contractor shall continue the Trade Contract Work and maintain the Construction Schedule during any dispute mitigation or resolution proceedings. If the Trade Contractor continues to perform, the Owner shall continue to make payments in accordance with this Agreement.

12.2 DIRECT DISCUSSIONS If the Parties cannot reach resolution on a matter relating to or arising out of the Agreement, the Parties shall endeavor to reach resolution through good faith direct discussions between the Parties' representatives, who shall possess the necessary authority to resolve such matter and who shall record the date of first discussions. The authorized representative for the Trade Contractor is identified in Paragraph 3.4 of the Agreement. The authorized representative for the Owner is identified in Paragraph 4.2 of the Agreement. The parties' authorized representative are, among other things, authorized to resolve matters of disagreement and disputes between the Parties. If the dispute remains unresolved after fifteen (15) Days from the date of first discussion, the Parties shall submit such matter to the dispute mitigation and dispute resolution procedures selected herein.

12.3 MITIGATION The Parties agree that dispute mitigation procedures provided in this Project. Disputes remaining unresolved after direct discussions shall be directed to the selected mitigation procedure immediately below. The dispute mitigation procedure shall result in nonbinding finding on the matter. This may be introduced as evidence at a subsequent binding adjudication of the matter, as designee on Paragraph 12.5. The Parties agree that the dispute mitigation procedure shall be

(Designate only one.)

☒ Project Neutral

☐ Dispute Review Board

12.3.1 MITIGATION PROCEDURES The Project Neutral/Dispute Review Board shall be mutually selected and appointed by the Parties and shall execute a retainer agreement with the Parties establishing the scope of the Project Neutral/Dispute Review Board's responsibilities. The costs and expenses of the Project Neutral/Dispute Review Board shall be shared equally by the Parties. The Project Neutral/Dispute Review Board shall be available to either Party, upon request, throughout the course of the Project, and shall make regular visits to the Project so as to maintain an up-to-date understanding of the Project progress and issues and to enable the Project Neutral/Dispute Review Board to address matters in dispute between the Parties promptly and knowledgeably. The Project Neutral/Dispute Review Board shall issue nonbinding findings within five (5) business Days of referral of the matter to the Project Neutral, unless good cause is shown.

12.3.2 If the matter remains unresolved following the issuance of the nonbinding finding by the mitigation procedure or if the Project Neutral/Dispute Review Board fails to issue nonbinding findings



within five (5) Days of the referral, the Parties shall submit the matter to the binding dispute resolution procedure designated in section 12.5.

12.4 **MEDIATION** If direct discussions pursuant to section 12.2 do not result in resolution of the matter and no dispute mitigation procedure is selected under section 12.3, the Parties shall endeavor to resolve the matter by mediation through the current Construction Industry Mediation Rules of the American Arbitration Association, or the Parties may mutually agree to select another set of mediation rules. The administration of the mediation shall be as mutually agreed by the Parties. The mediation shall be convened within thirty (30) business Days of the matter first being discussed and shall conclude within forty-five (45) business Days of the matter first being discussed. Either Party may terminate the mediation at any time after the first session, but the decision to terminate shall be delivered in person by the terminating Party to the non-terminating Party and to the mediator. The costs of the mediation shall be shared equally by the Parties.

12.5 **BINDING DISPUTE RESOLUTION** If the matter is unresolved after submission of the matter to a mitigation procedure or to mediation, the Parties shall submit the matter to the binding dispute resolution procedure designated herein.

(Designate only one.)

☐ Arbitration using the current Construction Industry Arbitration Rules of the American Arbitration Association

☒ Litigation in either the state or federal court having jurisdiction of the matter in the location of the Project.

12.5.1 The costs of any binding dispute resolution procedures shall be borne by the non-prevailing Party, as determined by the adjudicator of the dispute. However, the costs of binding dispute resolution does not include attorney fees. The Parties are each responsible for paying for their own attorney fees.

12.5.2 **VENUE** The venue of any binding dispute resolution procedure shall be Des Moines, Iowa.

12.6 **MULTIPARTY PROCEEDING** All parties necessary to resolve a claim shall be parties to the same dispute resolution proceeding. Appropriate provisions shall be included in all other contracts relating to the Work to provide for the joinder or consolidation of such dispute resolution procedures.

12.7 **LIEN RIGHTS** The Trade Contractor acknowledges that it has no mechanic's lien rights on this Project because it is a public improvement project.

ARTICLE 13 MISCELLANEOUS PROVISIONS

13.1 **ASSIGNMENT** Neither the Owner nor the Trade Contractor shall assign their interest in this Agreement without the written consent of the other except as to the assignment of proceeds. The terms and conditions of this Agreement shall be binding upon both Parties, their partners, successors, assigns and legal representatives. Neither Party to this Agreement shall assign the Agreement as a whole without written consent of the other. If either Party attempts to make such an assignment, that Party shall nevertheless remain legally responsible for all obligations under this Agreement, unless otherwise agreed by the other Party.

13.2 **GOVERNING LAW** This Agreement and all disputes arising there from shall be governed by the Iowa law.

13.3 **SEVERABILITY** The partial or complete invalidity of any one or more provisions of this Agreement shall not affect the validity or continuing force and effect of any other provision.



13.4 NO WAIVER OF PERFORMANCE The failure of either Party to insist, in any one or more instances, on the performance of any of the terms, covenants or conditions of this Agreement, or to exercise any of its rights, shall not be construed as a waiver or relinquishment of such term, covenant, condition or right with respect to further performance or any other term, covenant, condition or right.

13.5 TITLES AND GROUPINGS The titles given to the articles of this Agreement are for ease of reference only and shall not be relied upon or cited for any other purpose. The grouping of the articles in this Agreement and of the Owner's specifications under the various headings is solely for the purpose of convenient organization and in no event shall the grouping of provisions, the use of sections or the use of headings be construed to limit or alter the meaning of any provisions.

13.6 ASSISTANCE OF COUNSEL AND INTERPRETATION The Parties agree that they had the opportunity to obtain the assistance of counsel in reviewing the Agreement terms prior to execution. This Agreement shall be construed neither against nor in favor of either Party, but shall be construed in a neutral manner.

13.7 RIGHTS AND REMEDIES The Parties' rights, liabilities, responsibilities and remedies with respect to this Agreement, whether in contract, tort, negligence or otherwise, shall be exclusively those expressly set forth in this Agreement.

13.8 ADDITIONAL PROVISIONS (Insert here other provisions, if any, that pertain to this Agreement See Below.)

13.9 COMPLIANCE WITH LAW AND REGULATIONS The Trade Contractor shall comply with all applicable federal, state, and local laws, rules, ordinances, regulations and orders when performing services and/or performing work under this Agreement, including without limitation, all laws applicable to the prevention of discrimination in employment and the use of targeted small businesses as subcontractors or suppliers. The Trade Contractor declares that it has complied with all federal, state and local laws regarding business permits and licenses that may be required to provide the services and work required by this Agreement. The Trade Contractor further acknowledges that if this Project is a recipient of Federal financial assistance that it may be subject to requirements of Federal Acts and Executive Orders as mandated by Federal agencies having authority and jurisdiction to enforce and ensure compliance with such laws and regulations including, but not necessarily limited to, the Davis Bacon Act and other Federal Acts and Executive Orders.

13.10 EMPLOYMENT PRACTICES: It is the intent of the Iowa Department of Administrative Services to assure equal employment opportunity in all contract work as required by law. Vendors, are required to take affirmative action to ensure that applicants employed or seeking employment with them are treated equally as required by law. Vendors shall not illegally discriminate against any employee. During the course of the Project, the Vendor may be required to show compliance with the EEO and Affirmative Action requirements. Noncompliance with the provisions set forth at the time of contract award may result in termination or suspension of the Agreement in whole or in part. All vendors and service providers working under the terms of this Agreement are prohibited from engaging in discriminatory employment practices forbidden by Iowa law. Vendors shall complete and submit the Nondiscrimination Clause form for the Owner's approval.

13.11 RECIPROCAL BIDDER PREFERENCE In accordance with Iowa Code Section 73A.21, as amended in 2011 by HF 648, if the Trade Contractor is not a resident bidder of Iowa, as defined by law, then the Trade Contractor must specifically identify in writing with its bid any and all preferences or preferential treatment (including preferences related to labor) enforced by the state or foreign country in which the Trade Contractor is a resident. If the low bid Trade Contractor is not a resident bidder of Iowa and the Trade Contractor's foreign State of residence enforces such a preference then the Owner shall reciprocally enforce the preference in favor of a resident bidder of Iowa. Failure on the part of the Trade Contractor to completely and accurately abide by this legal requirement may, among other things, result in civil penalties and void this Agreement. The Trade Contractor should contact its attorney regarding this legal requirement if the Trade



Contractor has questions regarding its meaning or application.

13.12 LABOR RELATIONS The Trade Contractor shall comply with all Iowa and Federal labor laws. In accordance with Executive Order Number 69, issued by the Governor of Iowa on or about January 14, 2011, no project labor agreement (also known as a PLA), or similar, will be used on this Project. Iowa is a right to work state. No consultant, contractor, or employee shall be obligated to contract with or join any labor organization as a condition of performing work on this Project.

ARTICLE 14 TRADE CONTRACT DOCUMENTS

14.1 The Trade Contract Documents in existence at the time of execution of this Agreement are as follows:

RFBXXXXXXXXX Bid Package X

14.2 INTERPRETATION OF TRADE CONTRACT DOCUMENTS

14.2.1 The drawings and specifications are complementary. If Trade Contract Work is shown only on one but not on the other, the Trade Contractor shall perform the Trade Contract Work as though fully described on both consistent with the Trade Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

14.2.2 In case of conflicts between the drawings and specifications, the specifications shall govern. In any case of omissions or errors in figures, drawings or specifications, the Trade Contractor shall immediately submit the matter to the Owner for clarification. The Owner's clarifications are final and binding on all Parties, subject to an equitable adjustment in Trade Contract Time or Price pursuant to ARTICLE 6 and ARTICLE 7 or dispute resolution in accordance with ARTICLE 12.

14.2.3 Where figures are given, they shall be preferred to scaled dimensions.

14.2.4 Any terms that have well-known technical or trade meanings, unless otherwise specifically defined in this Agreement, shall be interpreted in accordance with their well-known meanings. This Agreement entered into as of the date entered in ARTICLE 1.

14.2.5 PRECEDENCE In case of any inconsistency, conflict or ambiguity among the Trade Contract Documents, the documents shall govern in the following order: (a) Trade Contract Change Orders and written amendments to this Agreement; (b) this Agreement; (c) subject to subsection 14.2.2 the drawings, specifications and addenda issued prior to the execution of this Agreement; (d) approved submittals; (e) information furnished by the Owner pursuant to subsection 4.1.3; (f) other documents listed in this Agreement. Among all the Trade Contract Documents, the term or provision that is most specific or includes the latest date shall control. Information identified in one Trade Contract Document and not identified in another shall not be considered to be a conflict or inconsistency.

This Agreement entered into as of the date entered in ARTICLE 1.

OWNER State of Iowa, Department of Administrative Services



Trade Contractor: *Contractor Name*

By: _____

(Authorized Representative)

Name:

Title:

Date:

Owner: State of Iowa - DAS

By: _____

(Authorized Representative)

Name:

Title:

Date:

END OF DOCUMENT.



SECTION 00 6000

PERFORMANCE AND PAYMENT BOND

PART 1 - GENERAL

1.01 PERFORMANCE AND PAYMENT BOND

- A. Performance and payment bonds to be used on this project, ConsensusDocs 260 and 261 are attached for reference following this page. ConsensusDocs performance and payment bonds are not required (other standard forms are acceptable to the State of Iowa).

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION



CONSENSUSDOCS 260 **PERFORMANCE BOND**

This document was developed through a collaborative effort of organizations representing a wide cross-section of the design and construction industry. The organizations endorsing this document believe it represents a fair allocation of risk and responsibilities for all project participants.

Endorsing organizations recognize that this document must be reviewed and adapted to meet specific needs and applicable laws. This document has important legal and insurance consequences. You are encouraged to consult legal, insurance and surety advisors before completing or modifying this document. The software includes a notes section indicating where information is to be inserted to complete this document. Further information and endorsing organizations' perspectives are available at www.consensusdocs.org/guidebook.

For Use with ConsensusDOCS 200, Standard Form of Agreement and General Conditions Between Owner and Constructor (Where the Contract Price is a Lump Sum) and ConsensusDOCS 500, Standard Agreement and General Conditions Between Owner and Construction Manager.

The Owner, _____, (the "Owner") and the Constructor, _____, (the "Constructor") have entered into a Contract (the "Contract") dated _____ for _____ (the "Project"). The Contract is incorporated by reference into this Performance Bond (the "Bond").

By virtue of this Bond, the Constructor as Principal and _____ as Surety ("Surety"), are bound to the Owner as Obligee in the maximum amount of _____ Dollars (\$ _____) (the "Bond Sum"). The Constructor and Surety hereby bind themselves, their heirs, executors,

IMPORTANT: A vertical line in the margin indicates a change has been made to the original text. Prior to signing, recipients may wish to request from the party producing the document a "redlined" version indicating changes to the original text. Consultation with legal and insurance counsel and careful review of the entire document are strongly encouraged.

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administrators, successors and assigns, jointly and severally, as provided herein.

1. **GENERAL CONDITIONS** It is the condition of this Bond that if the Constructor performs its Contract obligations (the "Work"), the Surety's obligations under this Bond are null and void. Otherwise the Surety's obligations shall remain in full force and effect. The Surety waives any requirement to be notified of alterations or extensions of time made by the Owner in the Contract. The Owner may not invoke the provisions of this Bond unless the Owner has performed its obligations pursuant to the Contract. Upon making demand on this Bond, the Owner shall make the Contract Balance (the total amount payable by the Owner to the Constructor pursuant to the Contract less amounts properly paid by the Owner to the Constructor) available to the Surety for completion of the Work.

2. **SURETY OBLIGATIONS** If the Constructor is in default pursuant to the Contract and the Owner has declared the Constructor in default, the Surety promptly may remedy the default or shall:

- a. Complete the Work, with the consent of the Owner, through the Constructor or otherwise;
- b. Arrange for the completion of the Work by a Constructor acceptable to the Owner and secured by performance and payment bonds equivalent to those for the Contract issued by a qualified surety. The Surety shall make available as the Work progresses sufficient funds to pay the cost of completion of the Work less the Contract Balance up to the Bond Sum; or
- c. Waive its right to complete the Work and reimburse the Owner the amount of its reasonable costs, not to exceed the Bond Sum, to complete the Work less the Contract Balance.

3. **DISPUTE RESOLUTION** All disputes pursuant to this Bond shall be instituted in any court of competent jurisdiction in the location in which the Project is located and shall be commenced within two years after default of the Constructor or Substantial Completion of the Work, whichever occurs first. If this provision is prohibited by law, the minimum period of limitation available to sureties in the jurisdiction shall be applicable.

This Bond is entered into as of _____.

SURETY _____ (seal)

By:

Print Name: _____

Print Title: _____

(Attach Power of Attorney)

Witness:

CONSTRUCTOR _____ (seal)

By:

Print Name: _____

Print Title: _____

Witness:

(Additional signatures, if any, appear on attached page)



CONSENSUSDOCS 261 **PAYMENT BOND**

This document was developed through a collaborative effort of organizations representing a wide cross-section of the design and construction industry. The organizations endorsing this document believe it represents a fair allocation of risk and responsibilities for all project participants.

Endorsing organizations recognize that this document must be reviewed and adapted to meet specific needs and applicable laws. This document has important legal and insurance consequences. You are encouraged to consult legal, insurance and surety advisors before completing or modifying this document. The software includes a notes section indicating where information is to be inserted to complete this document. Further information and endorsing organizations' perspectives are available at www.consensusdocs.org/guidebook.

For Use with ConsensusDOCS 200, Standard Form of Agreement and General Conditions Between Owner and Constructor (Where the Contract Price is a Lump Sum) and ConsensusDOCS 500, Standard Agreement and General Conditions Between Owner and Construction Manager.

The Owner, _____, (the "Owner ")
 and the Constructor, _____,
 (the "Constructor") have entered into a Contract (the "Contract") dated _____ for
 _____ (the "Project"). The Contract is
 incorporated by reference into this Payment Bond (the "Bond").

By virtue of this Bond, the Constructor as Principal and _____ as
 Surety ("Surety"), are bound to the Owner as Obligee in the maximum amount of
 _____ Dollars (\$ _____) (the
 "Bond Sum"). The Constructor and Surety hereby bind themselves, their heirs, executors,

IMPORTANT: A vertical line in the margin indicates a change has been made to the original text. Prior to signing, recipients may wish to request from the party producing the document a "redlined" version indicating changes to the original text. Consultation with legal and insurance counsel and careful review of the entire document are strongly encouraged.

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administrators, successors and assigns, jointly and severally, as provided herein.

1. **GENERAL CONDITIONS** It is the condition of this Bond that if the Constructor promptly makes payment of all sums for all labor, materials, and equipment furnished for use in the performance of the work required by the Contract, the Surety's obligations pursuant to this Bond are null and void. Otherwise the Surety's obligations shall remain in full force and effect. The Surety waives any requirement to be notified of alterations or extensions of time made by the Owner in the Contract.

2. **SURETY OBLIGATION** Every Claimant who has not been paid in full before the expiration of a period of ninety (90) Days after such Claimant provided or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, may have a right of action on this Bond. The Surety's obligation to the Claimant(s) shall not exceed the Bond Sum.

3. **LIMITATION OF ACTION** No suit or action shall be commenced on this Bond by any Claimant:

a. Unless Claimant, other than one having a direct Contract with the Constructor, shall have given written notice to the Constructor, the Owner and the Surety within ninety (90) Days after the Claimant provided or performed the last of the work or labor, or furnished the last of the materials for which the claim is made, stating with substantial accuracy the amount claimed and the name of the Party to whom the materials were furnished, or for whom the work or labor was provided or performed. Such notice shall be served by any means which provides written third party verification of delivery to the Constructor at any place it maintains an office or conducts business, or served in any manner in which legal process may be served in the state in which the Project is located.

b. After the expiration of one (1) year from the date on which the Claimant last performed labor or furnished materials or equipment on the Project. If this provision is prohibited by law, the minimum period of limitation available to sureties in the jurisdiction shall be applicable.

c. Other than in any court of competent jurisdiction in the location in which the Project is located.

4. **CLAIMANT** A Claimant is defined as an individual or entity having a direct contract with the Constructor or having a contract with a subcontractor having a direct contract with the Constructor to furnish labor, materials or equipment for use in the performance of the Contract.

This Bond is entered into as of _____.

SURETY _____ (seal)

By:

Print Name: _____

Print Title: _____

(Attach Power of Attorney)

Witness:

CONSTRUCTOR _____ (seal)

By:

Print Name: _____

Print Title: _____

Witness:

(Additional signatures, if any, appear on attached page)

SECTION 01 1200

CONTRACT SUMMARY

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Project Information
- B. Project Summary
- C. Bid Scope Summary
- D. Work Hour Restrictions
- E. Access to Site
- F. Coordination with Occupants
- G. Rules for Construction Workers
- H. Bid Package Instructions

1.02 PROJECT INFORMATION

- A. Facility Name/Location: Community Based Corrections Facility, 1401 South 17th Ave, Marshalltown, Iowa 50158.
- B. DAS Project #: 9362.00
- C. Owner: State of Iowa, Department of Administrative Services, Hoover State Office Building, Level 3, 1305 East Walnut Street, Des Moines, IA 50319
- D. Owner's Representative: Brad Tonyan, Iowa Department of Administrative Services, 109 SE 13th Street, Des Moines, IA 50319
- E. Construction Manager: Michael Steen, DCI Group, 220 SE 6th Street Suite #200, Des Moines, IA 50309

1.03 PROJECT SUMMARY

- A. The project includes the replacement of existing an open loop geothermal system for a new closed loop system at the Community Based Corrections Facility.
- B. Target date to provide substantial completion is June 17, 2024.

1.04 BID SCOPE SUMMARY

- A. Scope Applicable to All Bid Packages:
 - 1. The Contractor's Work includes all labor, supervision, materials, equipment, services, supplies, tools, facilities, transportation, hoisting, storage, receiving, licenses, inspections, certifications, overhead, profit, or other items required or reasonably inferable to properly and timely perform and complete all work and services to be performed by the Contractor pursuant to this Agreement. Unless specifically stated otherwise, incidental work required to accomplish the work of this Bid Package shall be included the bid. This would include, but not be limited to, temporary facilities, protection of the work, security of equipment, materials, and work in progress, etc. Contractor's Work shall be performed in accordance with the Drawings, Specification Divisions 00 and 01, and Specification sections applicable to each Contractor's scope.
 - 2. Contractor is responsible for all labor and equipment to unload, account for all material delivered, stock, and delivery for this scope of work. Storage and delivery of materials and equipment at the Site shall be permitted only to the extent approved in advance by the Construction Manager, and if anything so stored obstructs the progress of any portion of the work, it shall be promptly removed or relocated by the Contractor without reimbursement.
 - 3. On site supervision by Prime Contractor at all times work by that contractor or their subcontractors/suppliers is taking place.

4. Provide all temporary facilities required for this scope of work including trailer, trailer power, telephone, secured storage, temporary power for work, temporary and task lighting for work, etc. as determined necessary by Contractor. Coordinate location of trailers, material storage and utility lines with Construction Manager. Limited space is available, and permission to bring any such facility or excess materials on to the site shall be approved by the Construction Manager.
5. Contractor shall provide all equipment and tools for Contractor's own cleanup. Clean up shall be done at end of every shift or more frequently if required for the Contractor to perform their work, for other Contractors to perform their work, as required by the Owner's operations, and at the discretion of the Construction Manager.
6. All turf, landscaping, and subgrade disturbances caused by equipment traffic or other activities related to the Contractor's scope shall be repaired or restored to proper conditions by the Contractor.
7. Protect adjacent existing building elements from damage from Scope of work. Repair existing building elements damaged during Contractor's Scope of work.
8. The Owner has retained the services of a commission agent (SystemWorks) for this project. It shall be the responsibility of contractors to cooperate with the commissioning agent including providing personnel for commissioning related meeting, the completion of Commissioning documentation, and onsite verifications.

1.05 WORK HOUR RESTRICTIONS

- A. Work hours are from 7:00 AM to 5:00 PM, Monday through Friday unless arrangements are made in advance.

1.06 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. Provide access to and from site as required by law and Owner:
 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 2. Do not obstruct roadways, sidewalks, or other public ways without permission of Owner and permit if required.
- C. Facility will be occupied at all times during duration of work. Contractor personnel shall conduct themselves in an agreeable manner at all times. Failure to do so may result in removal from the work site.

1.07 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.08 RULES FOR CONSTRUCTION WORKERS

- A. The staff of the State of Iowa has a responsibility to protect the public by providing a secure environment. All work site rules must be followed to the letter, at all times.
- B. Hot Work Permit Processes and Fire Watch, when necessary, will be adhered to for this project.
- C. All State properties are tobacco free. No smoking will be permitted or tolerated on campus unless in designated areas.
- D. You are permitted access only to the work site and no other area of the institution.
- E. No drugs, alcohol, or firearms are allowed on the work site.
- F. Do not leave money, drugs, alcohol, or firearms in your personal vehicle.
- G. Company and personal vehicles are to be parked and locked in designated or authorized area of the work.

- H. Secure all tools at the end of the day.
- I. Maintain control of all tools, supplies, and debris at all times during the work.
- J. Never leave keys in any vehicle. If a security officer finds keys in a vehicle, they are under orders to turn them in to a security supervisor.
- K. Do not give anything to residents or take anything from residents; if they offer, inform your supervisor.
- L. Secure all tools at the end of each day. Never leave tools unattended. All tools shall be checked in at the beginning of the day and checked out at the end of the day. If security officers find loose tools, they are under orders to turn them in to their supervisor.
- M. During an emergency, follow the instructions of the security staff.

1.09 BID PACKAGE INSTRUCTIONS

- A. **Bid Package #01 – Geothermal Systems:** Trade Contractor shall include all of the following, but not limited to, as part of the contract:
 - 1. Includes specification:
 - a. Division 00 – Procurement and Contracting Requirements
 - b. Division 01 – General Requirements
 - c. Division 23 – Heating, Ventilating, and Air Conditioning (HVAC)
 - 2. It will be the responsibility of the contractor to coordinate their scope of work with all specifications, drawings, and bid packages.
 - 3. This contractor shall be responsible for coordination of a joint locate meeting between the contractor, facility, DCI Group, and OneCall prior to any excavation or ground penetration.
 - 4. It shall be the responsibility of this contractor to complete the temporary connection for the water-cooled freezer and cooler. Upon the completion of the geothermal replacement, this contractor shall reconnect the freezer and cooler system to the geothermal.
 - 5. This contractor shall be responsible for the complete procurement and installation of the geothermal system, included but not limited to, earth work and clearing, horizontal boring, piping, geothermal vault, sump pump and discharge, surveying and staking, well installation, site restoration, GPS as-built of well locations, grouting, geothermal marking tape and tracing wire.
 - 6. This contractor shall be responsible for documenting bores, inspections, and testing with the information identified in specification sections as part of 23 8144. These records shall be recorded daily and submitted to the construction manager at intervals no longer than weekly.
 - 7. This contractor shall install and maintain orange safety fencing around the perimeter of work where equipment is located, hazards may be encountered, or to protect work.
 - 8. This contractor shall be responsible for hauling offsite all excess materials and spoils created by this bid package.
 - 9. This contractor shall be responsible for site restoration for areas impacted by construction activities. This shall include additional topsoil where necessary, fine grading, site seeding, and initial watering to bring the site back to original conditions. Contractor shall notify the construction manager to coordinate engineering approval prior to the spread of topsoil and seeding.
 - 10. Contractor shall be responsible for dewatering.
 - 11. This contractor shall be responsible for the demolition of mechanical and plumbing components to accommodate new work. This shall include, but not necessarily be limited to, piping, expansion tanks, valves, insulation, pumps, heat exchanger, and hangers/supports.
 - 12. Where penetrations through walls will be abandoned, this contractor shall infill per detail 9 on M101 of the construction drawings.
 - 13. It shall be the responsibility of this contractor to provide and install all new mechanical and plumbing equipment identified in the construction documents. This includes, but is not necessarily limited to, pumps, expansion tanks, glycol feeder, valves, gauges, supports, and vents.

14. This contractor shall be responsible for the flushing and filling of new and existing piping.
15. This contractor shall provide and install the new geothermal vault. As part of this work, the light and switch, outlet, sump pump, and controls shall be provided by this bid package, but the electrical and controls completed by Bid Package #02. Bid Package #01 shall be responsible for the thru-wall penetrations, including sealing after installation, for Bid Package #02 conduit. Junction boxes for electrical outlet and switch to be provided by and mounted by this package for wiring by Bid Package #02.
16. This contractor shall be responsible for painting of the geothermal vault as identified in the specifications.
17. This contractor shall be responsible for the supply, installation, and programming of all controls devices, equipment, workstations, and software. Bid Package #02 shall be responsible for electrical connections the controls devices. Contractor shall include
18. This contractor shall be responsible for all testing and balancing of the system as identified in the contract documents.

B. **Bid Package #02 – Electrical:** Trade Contractor shall include all of the following, but not limited to, as part of the contract:

1. Includes specification:
 - a. Division 00 – Procurement and Contracting Requirements
 - b. Division 01 – General Requirements
 - c. Division 26 – Electrical
2. This bid package will be responsible for all electrical permitting. This shall include the coordination, cost, and inspections associated with electrical permitting. All permits and inspection results shall be provided to the construction manager.
3. This contractor shall complete electrical disconnects to all equipment prior to work taking place by other contractors on this equipment.
4. It will be the responsibility of this contractor to supply and install all electrical connections, including pathways, circuits, and connections, for equipment supplied by Bid Package #01. This shall include, but not be limited to, pumps, geothermal vault receptable and light, VFDs, and glycol feeder.
5. Contractor shall provide new circuit breakers where called for in the construction documents.
6. This contractor shall be responsible for disconnecting, and demolition of abandoned wiring back to the electrical panel. Existing conduit can be reused where applicable and in acceptable condition.

C. **Work Performed by Owner:** The facility will perform the following work items:

1. Relocate all moveable furniture, fixtures and equipment (FF&E), including window treatments; and personal materials from each sequenced work area prior to demolition and construction activities and after new construction is completed.

END OF SECTION

SECTION 01 1201

GENERAL WORK REQUIREMENTS

1.01 BIDDING

- A. Trade Contractor shall include all applicable fees, permits, freight, hoisting, scaffolding, clean up, supervision, overhead, etc. to perform his work.
- B. The owner will provide the general building permit only. All other permits required for completion of contractor's scope of work or by any governing body are the responsibility of said contractor.
- C. Bidders to review ALL Bid Packages to fully understand the requirements of each package. Where two bid packages conflict, confirm with Construction Manager as to which package is to perform the work noted before bidding. After bidding, any conflict noted will be evaluated by the Construction Manager. The Construction Manager will then determine which package should perform the work and which package will credit the associated work's cost.
- D. Where conditions conflict in the project manual or project drawings, contact the Construction Manager for clarification. When in doubt figure the more extensive requirement.
- E. Each contractor is responsible for the identification of alternates and how they relate to each bid package. If a bid package is affected in ANY way by ANY of the alternates, an add/deduct should be noted on the bid form. If there is no change in cost write zero dollars.
- F. The Contractor should visit the site of the Work to acquaint the firm with all local conditions affecting the Contract, including the structure of the ground, the obstacles which may be encountered, and all other conditions relative to the Work to be performed; and shall not be allowed any extra compensation by reason of any difficulties or obstacles which the Bidder could have discovered or reasonably anticipated prior to Bidding. Contractor shall review Instructions to Bidders for coordination of site visits.
- G. On all project Drawings, figures take precedence over measurement by scale, and any scaling is done at the Contractor's own risk. The Design Professional shall decide on questions that may arise regarding the meaning and intent of the Project Drawings and Project Specifications. Should any details or figures have been omitted which are necessary to a clear understanding of the Work or should any error appear in either, or should discrepancies be found between the Project Drawings and Project Specifications, it shall be the duty of the Contractor to notify the Construction Manager of such omissions, errors, or discrepancies, and in no case proceed in uncertainty. Mistakes resulting from the Contractor's neglect to notify the Construction Manager in such matters shall be corrected at the expense of the Contractor. Bidders are responsible for all electronic documents and their use is at their risk.
- H. Construction Manager (DCI Group) has been engaged for this Project to serve as an advisor to the Owner and to provide assistance in administering the Contract for Construction between Owner and the Contractor. The Construction Manager will not be providing any self-performed work for this Project.
- I. All Contractors are responsible for on the job supervision of their work, or any subcontracted work. An onsite Superintendent or lead foreman is required during any time that work is being performed to coordinate their work and work with other trades. No superintendent or lead foreman may be replaced without approval of the Owner and DCI Group. Any work necessary to be performed after the regular working hours shall be supervised and shall be done at no additional cost to the Owner.
- J. All food and drinks shall be confined to CM designated areas and a maintained covered trash container shall be provided by the contractor. Failure to comply with this rule may cause a need for extra cleaning efforts by others which will result in a back charge to the Contractor.
- K. Tools, materials, and equipment storage and security is the responsibility of each Contractor.
- L. All work shall comply with the applicable codes and standards adopted by the Authority having Jurisdiction.
- M. All Authorities having Jurisdiction inspections shall be requested by the responsible contractor and coordinated through the Construction Manager. Attendance by contractors is mandatory as applicable to the work being inspected.
- N. All contractors must have the appropriate licenses to perform work in the jurisdictions.

- O. Before ordering any materials or performing any Work, the Contractors shall verify all measurements at the Project Site for the particular Work and be responsible for the correctness of same. No extra charge or compensation will be allowed to the Contractor on account of differences between actual dimensions and the measurements shown on the Project Drawings. Any noticeable discrepancy in this request shall be reported to the Construction Manager immediately for his consideration and decision. All the component parts of the Work shall be carefully checked and laid out in order that the structure as a whole shall conform to the intent of the Project Drawings and Project Manual.
- P. The Contractor shall have personnel attending regular project meetings. These meetings will be held at intervals established by the Construction Manager. Contractor must have representative attending when they are on the job or needed for coordination prior to having work start on the project. The representative attending must be able to adequately represent the Contractor and speak on the Contractors behalf providing valuable information to the meeting; specifically, things such as schedule, cost, production, manpower, etc.
- Q. Contractor will be required to attend all pre-installation conferences before commencement of related work.
- R. Trade Contractor shall complete a daily log for each work day on site and submit to Construction Manager. Content of daily log will be directed by Construction Manager.
- S. This Contractor is responsible to protect all openings made to the existing buildings envelope, as required for this bid package work, for the entire time work is being conducted until the new work scope is completed. This protection shall include but is not limited to protection against; rain, snow, wind infiltration, security and temperature fluctuations. Trade Contractor will maintain all weather protection provisions until permanent work is completed. All cost relating to damage incurred to existing facilities as a result of improper weather protection provisions will be borne by the Trade Contractor.

1.02 SAFETY

- A. The contractor shall comply with all local and federal, safety and health requirements.
 - 1. Contractor will provide a safety plan customized for the project to DCI Group.
 - 2. It is the contractor's responsibility to notify other contractor's on the jobsite of any hazardous materials to which their employees may be exposed.
 - 3. All Contractors shall inform their employees to immediately advise their supervisor of any unsafe conditions that are encountered. The supervisor shall promptly remediate such danger and/or contact the Construction Manager.
 - 4. Contractors performing hot work are to have a fire extinguisher in their work areas at all times as applicable.
 - 5. All Contractors are responsible for their own fall protection.
 - 6. Contractors are required to provide emergency phone numbers upon the request of the Construction Manager. Emergency phone numbers are numbers where the Contractor can be reached during off hours.
 - 7. All floor edge, roof and similar openings, barricades, handrails, or cabling for fall protection will be installed by the Contractor that creates the hazard as part of that Contractor's scope of work. At no time shall an opening be left unprotected from fall hazard. All Contractors shall protect and maintain such devices per OSHA standards. When a device conflicts with the work of this bid package or when the work of this bid package replaces the need for such devices, this Contractor is responsible for removal. If the work of this Contractor requires additional holes/penetrations, this Contractor shall provide necessary protection until final materials are installed.
 - 8. No fire exit can be blocked at any time.

1.03 SITE MANAGEMENT

- A. All contractors are responsible for all their own utility locates. This shall include both public and private locates. All Contractors shall coordinate locates with One Call Services.

- B. When active services are encountered in the Work, protect, brace and support existing active sewers, gas, electric or other services, where required for proper execution of the Work. If existing active services are encountered that require relocation, make request in writing for determination. Do not proceed with Work until written directions are received. Do not prevent or disturb operation of active services that are to remain.
- C. All contractors are required to protect their work. Provide proper protection for all existing work performed by others when performing your work next to, or around, other materials. Repair or replacement of any damaged material will be the responsibility of the contractor who damaged it.
- D. All contractors/vendors are responsible for their own cutting and patching unless otherwise specified.
- E. All contractors shall provide protection to the building at any penetrations created by that bid package. This shall include protection from rain, wind, temperatures, humidity, animals, or unauthorized access. Protection shall be in place and maintained until final penetration sealants or repairs are made.
- F. All contractors are responsible for maintaining dust control during their work.
- G. Contractors shall be responsible for maintaining traffic control coordination with the Owner, DCI Group, and the Authority Having Jurisdiction.
- H. Public and private roadways will be maintained and cleaned as required by the contractor leaving debris, mud, excess gravel, etc. on roadways at their expense as defined in bid packages.
- I. No steel track mounted equipment will be allowed on finished paved surfaces. Any damage to the finished paved surfaces will be repaired at the cost to the contractor causing such damage.
- J. Bridging of finished pavement will be responsibility of the contractor. This includes bridging curbs, pavement, sidewalks, etc. Any damage to the aforementioned including pavement markings will be repaired or replaced at the cost of the contractor causing such damage.
- K. Contractors that have work that requires equipment off of the existing road ways are required to locate and protect from damage all under and above ground existing features such as utilities, tunnels, landscaping, etc... The Contractor will be responsible to repair back to original condition any damages that occur, including but not limited to ruts and sod damage.
- L. Any areas disturbed or damaged by one's operation are to be repaired to Owner/Construction Manager's satisfaction.
- M. Contractor shall clean their installed materials prior to the next successor activity.
- N. Any signs located on the jobsite must be approved by the Construction Manager. Signage will not be allowed in most cases unless it is required for safety or provides instruction.
- O. Receiving, unloading and handling of material provided by the bid package shall be included. Spotting location shall be coordinated with the Construction Manager. All deliveries shall be coordinated with other Contractors and Construction Manager in advance of the delivery. Provide freight to the jobsite for any material provided. If storage is not available onsite, each bid package shall include other means of secure storage. If contractor is not onsite to unload delivery, the delivery will be rejected and will have to be re-scheduled at the contractor's expense. Materials must be stored off the ground, out of the mud and on a solid surface. As required or needed, material should be stored on dunnage or pallets in order to keep it off the ground or surface below. Special storage is the responsibility of respective contractor.
- P. Contractor shall not store materials within construction designated locations without approval from Construction Manager. No materials storage will be allowed that may inhibit construction progress.
- Q. The Contractors shall layout and correctly establish all lines, levels, grades, positions, walls, partitions, equipment and location of all Work on the Project and be responsible for their accuracy and proper correlation with control lines, monuments and data furnished. Such monuments and data shall be carefully preserved and, if displaced, reset at the expense of the persons displacing them.
- R. All Contractors are responsible for the coordination of their work with the complete set of specifications, construction drawings, addenda, request for information (RFI's), Architect's Instruction to Contractor (ITC), shop drawings, coordination drawings, and other contract modifications.
- S. Contractor shall carefully inspect any work performed by others that is to receive, align, abut or similarly relate to the Contractor's work and shall immediately notify the Construction Manager in

writing of any apparent defects or inconsistencies. The Contractor is responsible for coordinating and verifying the dimension, measurements, and elevations at the project site relevant to the Contractor's work. If Contractor commences his work without such written notice, such commencement shall constitute acceptance of all such work performed by others and of all such field conditions, and all costs incurred in connection with the Contractor's work as a result thereof shall be borne by Contractor.

- T. Incorporate construction tolerances for the work of others into the design of the systems in this scope of work. Include field measurements of work by others and any necessary adjustments to systems prior to fabrication to accommodate such allowable tolerances, or accept all costs to correct materials, which do not fit job conditions.
- U. Any interior work that is scheduled to be completed while Owner is in normal operation must be sensitive to the Owners continued use of the building. No workers are allowed to be in areas of the building that are not directly related to scope of work. Hallways and general access paths to construction areas must also be kept clean at all times. The Owner has the right at any time to shut down any construction activities that they deem to be too much of a distraction to the occupants of the building.
- V. All contractors are responsible for familiarizing themselves with the coordination and sequencing requirements related to Owner furnished equipment.
- W. If not already required by the contract documents and reasonably requested by the Construction Manager, the Contractor shall prepare coordinated drawings in areas of congestion specifically noting and advising the Construction Manager of potential conflicts between the Contractor's work and other work at the project. Even with such cooperative and coordinated efforts should a conflict occur the Construction Manager will determine how such conflicts should be resolved and its decision in that regard will be final. The Contractor agrees to abide by such decisions and make any changes required to eliminate such conflict without additional costs or expense to the Owner.

1.04 SCHEDULE MANAGEMENT

- A. Prior to the commencement of the construction for the Prime Contract Work, the Prime Contractor shall participate in a minimum of two (2) joint planning meetings with the Construction Manager and other Prime Contractors for the purpose of planning the overall Construction Schedule. A Preliminary Construction Schedule as developed by the Construction Manager will be used as the basis of the overall Construction Schedule. In consultation with the Prime Contractor, the Construction Manager shall incorporate the Prime Contract Work and work of other prime contractors into the overall Construction Schedule for the entire project. Critical Milestones and working hours as defined by the Construction Manager (as included in the bidding documents) will not be altered. The Prime Contractor shall on a weekly basis (at a minimum) provide the Construction Manager scheduling information with regards to progress and work to be performed in the next 4 (four) weeks. The Prime Contractor shall be bound by the Construction schedule. Nothing in the Prime Contract Agreement shall relieve the Prime Contractor of any liability for any unexcused failure to comply with the agreed upon overall Construction Schedule or any completion dates. The Construction Manager shall have the right to coordinate the Prime Contractors, including the right, if necessary, to change the time, order and priority in which the various portions of the Prime Contract Work and other work associated with the Project shall be performed.
- B. All Contractors shall cooperate with the Construction Manager and with other Contractors. The completion of the Work will depend upon a collective effort by all parties involved.

1.05 GENERAL HOUSEKEEPING

- A. Daily cleanup (broom clean) of dust and debris from construction operation is part of each contractor's scope of work. If any contractor fails to keep the site clean and organized on a continuous basis, the Construction Manager will notify the contractor in writing only once. The contractor will then have 24 hours to correct the situation. If the contractor fails to correct the situation, the Construction Manager will hire another party for cleaning and charge the said

contractor. Trade Contractor shall submit prior to beginning work a plan to the Construction Manager defining manpower and methods for achieving daily cleanup. If Construction Manager deems necessary, each Trade Contractor shall provide 1 employee for each 5 employees on the project to clean all work areas and/or staging areas to a broom clean condition. If the Trade Contractor has less than 5 employees on site, the contractor will provide 1 employee to the necessary cleanup requirement. Cleanup duration will take as long as it takes to achieve the broom clean results.

END OF SECTION 01 1201

SECTION 01 1202

SPECIAL WORK REQUIREMENTS

- A. Bidders are to hold their bids for a period of thirty (30) days after the bid.
- B. Contractors and their employees shall show upmost respect for the occupying residents and staff. Profanity and unnecessary loud language will not be tolerated.
- C. Each Contractor working in Owner occupied space will provide necessary means of protection to floors, walls, ceilings, equipment as required to accomplish work without harming or damaging existing conditions. All damage performed during this work will be charged to the responsible contractor.
- D. The use of motorized scissor lifts will not be allowed except under special circumstances and must have prior approval from the Construction Manager.
- E. All deliveries must be accepted by the Contractor.
- F. Owner will provide snow removal to all existing pavements on campus that are not under construction. See specific Contractor's responsibility under specific Bid Packages.
- G. Contractor includes complete cleanup and haul off to dumpster (Provided by Bid Package #1) for all typical construction debris resulting from this scope of work. Bid Package #1 Contractor will be responsible for providing dumpsters as required for the entire project duration and understands that ALL Bid Packages will be using dumpster. Each Prime Contractor to provide brooms, shovels and other equipment for cleanup for their respective scope of work. Excess materials shall be removed from the site at the Contractor's expense. All primes shall remove debris on a daily basis.
- H. Contractor will be responsible to provide portable generators or an alternative power source for all tools and equipment that require a power source higher than 120 Volt.
- I. Contractors working on roofs are required to take appropriate precautionary measures to protect existing roofing from damage. Contractors are required to take all precautionary measures necessary to ensure that their items do not fall or blow off the roofs.
- J. Prior to performing work in areas with smoke and fire detection systems the Contractor shall coordinate with the CM precautionary measures to eliminate false alarms. If the fire alarm system is activated and there is not an emergency the Contractor responsible for the false activation shall be responsible to pay for all resulting owner incurred expenses such as Emergency Response fees.
- K. Bid Package #01 will provide temporary toilet facilities for ALL Contractors and for the entire duration of the project. Temporary toilets shall meet all OSHA regulations.
- L. Contractors shall document existing conditions prior to start of work. All damage to existing pavements, landscaped areas, and all other existing property will be repaired by the responsible Contractor. Interior as well.
- M. The Prime Contractor's shall provide the Construction Manager detailed information as outlined below for the purpose of developing the Construction Schedule:
 - a. **SUBMITTALS:**
 - i. Submittal Schedule: Prime Contractor shall submit a submittal schedule listing all required submittals, submittal "To CM" dates, procurement durations, and expected dates for materials to be on the jobsite. The submittal schedule shall be submitted to the CM within five (5) business days of receipt of Owner/Prime Contractor Agreement.
 - ii. Format: Submittal Schedule shall be prepared in an Excel spreadsheet.
 - iii. Materials & Long Lead Procurement: Prime Contractor shall identify any/all submittal items that require "field verifies" and also identify the dates when these field verifies can be taken.
- N. See preliminary construction schedule in Section 00 3113. This schedule will aid the bidder(s) in understanding the preliminary scheduling and planning for the project. As the construction schedule is finalized the **Prime Contractor and their Subcontractors** shall participate in a meeting with the Construction Manager and other Prime Contractors for the purpose of

presenting the overall Construction Schedule. These "Subcontractors" shall be any/all subcontractors who will be performing Work on the project.

- O. Per the preliminary construction schedule the bidder(s) acknowledges that there are multiple mobilizations, phases, sub-phases, material deliveries, and milestone completion dates required in order to complete the work.
- P. The Owner owns the weather duration contingency as shown in the preliminary construction schedule on the following pages. The Construction Manager manages and will adjust the weather duration contingency. As weather days are not utilized the substantial completion dates shall be adjusted accordingly.
- Q. **Expected work hours will be 7:00 AM to 5:00 PM Monday thru Friday (5 day work week). Contractors requiring working time other than these hours are to coordinate and receive approval in advance from the Construction Manager. The Contractor shall provide at his expense increased work crews and/or overtime necessary to meet the scheduled milestones. Contractor shall immediately notify the Construction Manager of any delays in the work.**
- R. After contract award bid the Contractor is required to attend a meeting with the Construction Manager to review bid package scopes.
- S. Parking and material staging on site will be limited. All contractors shall coordinate one's parking and material staging with the DCI Group Project Manager, DCI Superintendent or DCI Designated Personnel.
- T. The jobsite is on Public Property. Smoking or smokeless tobacco **WILL NOT** be allowed. Also, no shelled sunflower seeds are allowed inside the enclosed facility.
- U. No radios or headsets are allowed in the construction areas.
- V. All warranties start at Project Substantial Completion, Contractor will be required to provide from this date and not the startup date of the equipment. Contractor will not be compensated for any cost related to purchasing extended warranties to meet this requirement. See Special Work Requirements for project schedule information.
- W. Contractors shall maintain accurate as-built construction records and provide complete clean and legible copies to Construction Manager on completion of work. All Contractors will be required to provide electronic copies as well as hard copies of all O&M's and as-built drawings. See Project Manual for additional Closeout requirements.

END OF SECTION 01 01202

SECTION 01 2500

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Substitution Procedures
- B. Request for Substitution form

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 SUBSTITUTION PROCEDURES

- A. Where the Bidding Documents stipulate a specific product be provided by naming one or more manufacturer and model, a substitute product will be considered when written request is received by the date and time identified in Section 00 1113 NOTICE TO BIDDERS. Substitution requests will be considered for all products, even if the specification does not include a statement such as “or equal,” “equal to,” “equivalent to,” or “basis of design,” unless noted otherwise.
- B. References in the Bidding Documents to brand or trade names are intended to illustrate the general characteristics of the item and not to limit competition unless noted otherwise.
- C. The written request shall be on the “Request for Substitution” form included in the Project Manual. If no such form is included, the request shall be provided on the letterhead of the company making the request.
- D. Substitution requests received after the specified date will be viewed in the context of a Change Order to the Contract, and consideration will only be given in the event a product becomes unavailable or not practical due to no fault of the Contractor, or the substitution is substantially to the Owner’s advantage (equal product for less cost or higher quality product at no change in Contract Sum).
- E. Document each substitution request with complete data substantiating compliance of the proposed substitution with the Bidding Documents. Each request shall identify the specified product for which the substitution is requested, and shall clearly describe the product for which approval is requested. The burden shall be on the requester to demonstrate the proposed substitute product’s suitability for use in the Work and its equivalency or superiority in function, appearance, quality, and performance with the product named in the Bidding Documents.
- F. A description of any changes to the Bidding Documents that the proposed substitution will require shall be included with the request. The requester shall affirm that dimensions shown on the Drawings will not be affected by the substitute product, and that it will have no adverse effect on other trades, the construction schedule, or specified warranty requirements. The request for use of a substitute product shall be signed by an authorized representative of the firm submitting the request, who shall state that the firm will pay for any changes to the building design, including Design Professional’s design, detailing, and construction cost caused by the requested substitution if the substitution is approved for use in the Work.
- G. All such substitute products approved for use in the Work during the established period of time before receipt of Bids will be identified in a subsequent Addendum to the Bidding Documents.

3.02 REQUEST FOR SUBSTITUTION FORM

- A. A Request for Substitution Form is attached following this page.
- B. Substitution requests shall be emailed to the Issuing Officer at the email address provided in Instructions to Bidders Section 1.04.

END OF SECTION

SECTION 01 2600

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Change procedures

1.02 CHANGE PROCEDURES

- A. The Design Professional will advise of minor changes in the work not involving an adjustment to Contract Sum/Price or contract time as authorized.
- B. The Construction Manager may issue a Proposal Request that includes a detailed description of a proposed change with supplementary or revised drawings and specifications and a change in contract time for executing the change as provided by the Design Professional. The Trade Contractor will prepare and submit an estimate within 7 calendar days. Estimates shall be provided for the project at no cost, regardless of acceptance or rejection of proposal.
- C. The Trade Contractor may propose changes by submitting a Request for Information to the Construction Manager, describing the proposed change and its full effect on the work. Include a statement describing the reason for the change, and the effect on the Contract Sum/Price and contract time with full documentation and a statement describing the effect on work by separate or other contractors. Document any requested substitutions in accordance with the specifications. Construction Manager will forward the Request for Information on to the Design Professional for their official response.
- D. Stipulated Sum/Price Change Order: Based on executed Change Order and contractor's fixed price quotation.
- E. Unit Price Change Order: The change order will be executed on a fixed unit price basis for pre-determined unit prices and quantities. Changes in contract price or contract time will be computed as specified for time and material change orders.
- F. Time and Material Change Order: The change order will be executed on a not to exceed basis. Design professional and Construction Manager will determine the not to exceed estimated cost based on contractor's proposal for hourly rates and material costs. Maintain detailed records of work done on time and material basis. Time and Material tickets must be submitted daily to the Construction Manager for verification. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the work. Submit itemized account and supporting data after completion of change. A final deductive change order will be issued to reconcile final cost to the initial change order.
- G. Change Order Forms: CONSENSUSDOC Forms provided by Owner.
- H. Execution of Change Orders: The Construction Manager will issue change orders for signature of parties as provided in the Conditions of the Contract.
- I. With respect to pricing change orders, the percentage mark-up for overhead and profit is subject to the following limits:
 - 1. Fifteen (15) percent maximum for work directly performed by employees of the Constructor, Subcontractor or Sub-subcontractor.
 - 2. Five (5) percent maximum for work performed or passed through by a Subcontractor and passed through to the Owner by the Constructor.
 - 3. Five (5) percent maximum Subcontractor's mark-up for Work performed by a Sub-Subcontractor and passed through to the Owner by the Subcontractor and Constructor.
 - 4. The maximum allowable mark-up shall be twenty-five (25) percent passed through to the Owner by the Constructor under any circumstances. Overhead and profit shall be shown separately for the Constructor and each Subcontractor of any tier performing the Change Order Work.
- J. Contractor and subcontractor agree to provide and require all suppliers to provide, a detailed breakdown of labor, labor burden, materials, installation, rental, and fuel costs.

- K. Please refer to Article 8 of CONSENSUSDOCS 802- STANDARD FORM OR AGREEMENT BETWEEN OWNER AND TRADE CONTRACTOR for additional Change Procedures.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01 2900

PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Schedule of values
- B. Application for payment

1.02 SCHEDULE OF VALUES

- A. Coordination: Trade Contractor will coordinate preparation of the Schedule of Values with preparation of the Construction Manager's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Application for Payment forms with Continuation Sheets, Submittals Schedule, and Construction Manager's Construction Schedule.
 - 2. Submit original Schedule of Values in Procore within 14 days after date of Owner-Trade Contractor Agreement. Schedule of Values must be approved by Owner prior to submission for first application for payment.
- B. Format: Utilize the Table of Contents of this project manual. Identify each line item with number and title of the major specification section. Each major specification section should be further itemized by materials cost, labor cost and subcontractor cost for each building separately for the base bid and all accepted alternates. Identify site mobilization, bonds and insurance.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name and address of Owner, Trade Contractor, Construction Manager and Design Team.
 - c. DAS Project Number.
 - d. Date of Submittal.
 - 2. Revise the Schedule of Values to list approved Change Orders with each Application for Payment.

1.03 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications for payments as certified by the Design Professional and paid for by Owner.
 - 1. Application for Payment at time of Substantial Completion and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement. Progress payments shall be submitted to the Construction Manager. Any request for payment for work completed prior to June 30th of any year needs to be submitted by July 15th of the same calendar year.
- C. Payment Application Forms: Use AIA form G702 and G703 as the form for the Application for Payment or an equivalent approved by the owner.
- D. Include lien waiver forms required by the owner when applicable.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of the Trade Contractor. Construction Manager will return incomplete applications without action.
 - 1. Include amounts of Change Orders issued before last day of construction period covered by application.
- F. Waivers of Mechanic's Lien: If requested by Owner with each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment when applicable.

1. Owner reserves the right to designate which entities involved in the Work must submit waivers.
2. Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede submittal of first Application for Payment include the following:
 1. Schedule of Values
 2. Certificates of insurance and insurance policies.
 3. Lists of vendors and any subcontractors.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for the portion of the Work claimed as substantially complete.
 1. Include documentation supporting the claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Letter of Notification to all sub-contractors and suppliers of application for release of retainage.
 8. Evidence that claims have been settled.
- J. Payments will be made to the extent of the value of the work performed in the previous month less a retainage amount of 5% of the value of the work performed. Upon substantial completion for the entire work, a sum sufficient to decrease the total retained to 5% of the contract sum, plus such other retainage as the engineer shall determine for all incomplete work and unsettled claims will be authorized.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01 3100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Coordination
- B. Pre-construction meeting
- C. Progress meetings
- D. Coordination Meetings
- E. Requests for Interpretation (RFIs)
- F. Background Checks
- G. Utility Locates/Ground Penetrations

1.02 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the project manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Administrative procedures: The Trade Contractor will coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Trade Contractor's Construction Schedule.
 - 2. Provide updated information for Construction Manager's Construction Schedule.
 - 3. Preparation of Schedule of Values.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Pre-installation conferences.
 - 7. Project closeout activities
- C. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work, which are indicated diagrammatically on drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated conceal pipes and wiring within the construction. Coordinate locations of piping with finish elements.
- F. Coordinate completion and cleanup of work of separate sections in preparation for Substantial Completion.
- G. After owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of owner's activities.
- H. During construction coordinate use of site and facilities through Construction Manager.
- I. Comply with Construction Manager and Owner's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

- J. Make the following types of submittal to Architect through the Construction Manager via Procore:
1. Request for Information/Interpretation.
 2. Request for substitution.
 3. Shop drawings, product data, and samples.
 4. Test and inspection reports.
 5. Design data.
 6. Manufacturer's instructions and field reports.
 7. Applications for payment and change order requests.
 8. Progress schedules.
 9. Coordination drawings.
 10. Correction punch list and final correction punch list for substantial completion
 11. Closeout submittals

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION MEETING

- A. The Construction Manager and Owner will schedule a meeting after Notice of Award.
- B. Required: Design Professional, Owner, Construction Manager, Trade Contractor and any Sub Contractors.
- C. Agenda:
1. Execution of Owner-Contractor Agreement.
 2. Submission of executed bonds and insurance certificates.
 3. Distribution of Contract Documents.
 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 5. Designation of personnel representing the parties in Contract.
 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, change orders, RFIs and contract closeout procedures
 7. Tentative construction schedule.
 8. Critical work sequencing and long-lead items.
 9. Procedures for testing and inspecting.
 10. Preparation of Record Documents.
 11. Safety Procedures.
 12. Owner's requirements.
 13. Security and housekeeping procedures.
 14. Background Checks.
 15. Responsibility for temporary facilities and controls.
 16. Construction waste management.
 17. Logistics (use of premise, parking, work restrictions, maintain egress, etc.)
- D. The Construction Manager is to record minutes and distribute copies within two days after meeting to participants, with one copy to owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

- A. The Construction Manager shall schedule and administer meetings throughout progress of the work at bi-weekly intervals.
- B. The Construction Manager is to make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings, record minutes and distribute copies within two days to those affected by decisions made.
- C. Attendees may include: Project superintendent, major subcontractors and suppliers, Owner, Construction Manager, Architect/Engineer, as appropriate to agenda topics for each meeting.

All participants at the conference call shall be familiar with the Project and authorized to conclude matters relating to the Work.

D. Agenda:

1. Review minutes of previous meetings.
2. Review the Construction Manager's Construction Schedule.
3. Field observations, problems, and decisions.
4. Identification of problems that impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFI's.
7. Review of off-site fabrication and delivery schedules.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to work.
14. Access, temporary facilities and controls, housekeeping and progress cleaning.
15. Safety.
16. Status of proposal requests, pending changes, official Change Orders.

E. Minutes:

1. Following the meeting, the meeting minutes will be published in Procore by the Construction Manager for all parties.

3.03 COORDINATION MEETINGS

- A. Coordination meetings will be held at the discretion of the construction manager.

3.04 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, prepare and submit an RFI in Procore.
1. RFIs shall originate with Trade Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in the Work.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Specification Section number and title and related paragraphs, as appropriate.
 2. Drawing number and detail references, as appropriate.
 3. Field dimensions and conditions, as appropriate.
 4. Trade Contractor's suggested solution(s). If Trade Contractor's solution(s) impact the Contract Time or the Contract Sum, Trade Contractor shall state impact in the RFI.
 5. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
- C. Design Professional's Action: Design Professional will review each RFI, determine action required, and return it. Allow seven (7) working days for Design Professional's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day. The following RFIs will be returned without action:
1. Requests for approval of submittals.
 2. Requests for approval of substitutions.
 3. Requests for coordination information already indicated in the Contract Documents.
 4. Requests for adjustments in the Contract Time or the Contract Sum.
 5. Requests for interpretation of Design Professional's actions on submittals.
 6. Incomplete RFIs or RFIs with numerous errors.
 7. Design Professional's action may include a request for additional information, in which case Design Professional's time for response will start again.

- D. Design Professional's action on RFIs that may result in a change to the Contract Time or the Contract Sum/Price.
 - 1. If Trade Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Construction Manager in writing within ten (10) days of receipt of the RFI response.
- E. On receipt of Design Professional's response in Procore, review the response and notify Design Professional within seven (7) days if Trade Contractor disagrees with response.

3.05 BACKGROUND CHECKS

- A. Background checks must be performed on all on site employees, including sub-contractors.
- B. The Contractor hereby explicitly authorized the Iowa DAS to conduct criminal history and/or other background investigation(s) of the Contractor, its officers, supervisory personnel, employees, and other staff retained by the Contractor or their sub-contractors for the performance of the contract.
- C. A state of Iowa record check request form will be provided at the pre-construction meeting. Information required may include:
 - 1. Last Name
 - 2. First Name
 - 3. Middle Name
 - 4. Date of Birth
 - 5. State Driver's License or State ID #
 - 6. Social Security #

3.06 UTILITY LOCATES/GROUND PENETRATIONS

- A. Call Iowa One Call at 800-292-8989 to request a locate
 - 1. Requests must be least five (5) working days prior to ground penetration.

END OF SECTION

SECTION 01 3100.01

WEB BASED CONSTRUCTION MANAGEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Owner and Contractor shall utilize **Procore Technologies, Inc. Procore** system for electronic submittal of all data and documents (unless specified otherwise by the owner's representative) throughout the duration of the Contract. **Procore** is a web-based electronic media site that is hosted by **Procore Technologies, Inc.**, utilizing their **Procore** web solution. **Procore** will be made available to all contractors' project personnel, subcontractor personnel, suppliers, consultants and the Designer of Record. The joint use of this system is to facilitate; electronic exchange of information, automation of key processes, and overall management of the contract. **Procore** shall be the primary means of project information submission and management. When required by the Owners representative, paper documents will also be provided. In the event of discrepancy between the electronic version and paper documents, the paper documents will govern. **Procore** is a registered trademark of **Procore Technologies, Inc.**

1.02 USER ACCESS LIMITATIONS

- A. The Owner's Representative/Construction Manager will control the Contractor's access to **Procore** by allowing access and assigning user profiles to accepted Contractor personnel. User profiles will define levels of access into the system, determine assigned function-based authorizations (determines what can be seen) and user privileges (determines what they can do). Sub-contractors and suppliers will be given access to **Procore** through the Contractor. Entry of information exchanged and transferred between the Contractor and its sub-contractors and suppliers on **Procore** shall be the responsibility of the Contractor.
1. Joint Ownership of Data: Data entered in a collaborative mode (entered with the intent to share as determined by permissions and workflows within the **Procore** system) by the Owner's Representative and the Contractor will be jointly owned.

1.03 AUTOMATED SYSTEM NOTIFICATION AND AUDIT LOG TRACKING

- A. Review comments made (or lack thereof) by the Owner on Contractor submitted documentation shall not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor is responsible for managing, tracking, and documenting the Work to comply with the requirements of the Contract Documents. Owner's acceptance via automated system notifications or audit logs extends only to the face value of the submitted documentation and does not constitute validation of the Contractor's submitted information.

1.04 SUBMITTALS

- A. See Section 01 3300 SUBMITTAL PROCEDURES:
- B. Preconstruction Submittals
1. List of Contractor's key **Procore** personnel. Include descriptions of key personnel's roles and responsibilities for this project. Contractor should also identify their organization's administrator on the list.

1.05 COMPUTER REQUIREMENTS

- A. The Contractor shall use computer hardware and software that meets the requirements of the **Procore** system as recommended by **Procore Technologies, Inc.** to access and utilize

Procore. As recommendations are modified by **Procore**, the Contractor will upgrade their system(s) to meet the recommendations or better. Upgrading of the Contractor's computer systems will not be justification for a cost or time modification to the Contract. The contractor will ensure that connectivity to the **Procore** system (whether at the home office or job site) is accomplished through DSL, cable, T-1 or wireless communications systems. The minimum bandwidth requirement for using the system is 128kb/s. It is recommended a faster connection be used when uploading pictures and files into the system. **Procore** supports the current and prior two major versions of Chrome, Firefox, Internet Explorer, and Safari.

- B. The Contractor shall be responsible for the validity of their information placed in **Procore** and for the abilities of their personnel. Accepted users shall be knowledgeable in the use of computers, including Internet Browsers, email programs, cad drawing applications, and Adobe Portable Document Format (PDF) document distribution program. The Contractor shall utilize the existing forms in **Procore** to the maximum extent possible. If a form does not exist in **Procore** the Contractor must include a form of their own or provided by the Owner representative as an attachment to a submittal. Adobe PDF documents will be created through electronic conversion rather than optically scanned whenever possible. The Contractor is responsible for the training of their personnel in the use of **Procore** (outside what is provided by the owner) and the other programs indicated above as needed.
- C. User Access Administration: Provide a list of Contractor's key **Procore** personnel for the Owner's Representative acceptance. Contractor is responsible for adding and removing users from the system. The Owners Representative reserves the right to perform a security check on all potential users. The Contractor will be allowed to add additional personnel and sub-contractors to **Procore**.

1.06 CONNECTIVITY PROBLEMS

- A. **Procore** is a web-based environment and therefore subject to the inherent speed and connectivity problems of the Internet. The Contractor is responsible for its own connectivity to the Internet. **Procore** response time is dependent on the Contractor's equipment, including processor speed, Internet access speed, etc. and current traffic on the Internet. The Owner will not be liable for any delays associated from the usage of **Procore** including, but not limited to: slow response time, down time periods, connectivity problems, or loss of information. The contractor will ensure that connectivity to the **Procore** system (whether at the home office or job site) is accomplished through DSL, cable, T-1 or wireless communications systems. The minimum bandwidth requirement for using the system is 128kb/s. It is recommended a faster connection be used when uploading pictures and files into the system. Under no circumstances shall the usage of the **Procore** be grounds for a time extension or cost adjustment to the contract.

1.07 TRAINING

- A. The Construction Manager shall provide the necessary training to the Prime Contractor.

PART 2 - PRODUCTS

2.01 DESCRIPTION

- A. **Procore** project management application (no equal) Provided by Procore Technologies, Inc. www.Procore.com

PART 3 - EXECUTION

3.01 PROCORE UTILIZATION

- A. **Procore** shall be utilized in connection with submittal preparation and information management required by Sections:
 - 1. PROJECT MANAGEMENT AND COORDINATION
 - 2. CONSTRUCTION PROGRESS DOCUMENTATION
 - 3. SUBMITTAL PROCEDURES
 - 4. QUALITY REQUIREMENTS
 - 5. Other Division One sections.
 - 6. Requirements of this section are in addition to requirements of all other sections of the specifications.
- B. Design Document Submittals
 - 1. All design drawings and specifications shall be submitted as cad .dwg files or PDF attachments to the **Procore** submittal work flow process and form.
- C. Shop Drawings
 - 1. Shop drawing and design data documents shall be submitted as cad .dwg files or PDF attachments to the **Procore** submittal work flow process and form. Examples of shop drawings include, but are not limited to:
 - 2. Standard manufacturer installation drawings.
 - 3. Drawings prepared to illustrate portions of the work designed or developed by the Contractor.
 - 4. Steel fabrication, piece, and erection drawings.
- D. Product Data
 - 1. Product catalog data and manufacturer's instructions shall be submitted as
 - 2. PDF attachments to the **Procore** submittal work flow process and form. Examples of product data include, but are not limited to:
 - 3. Manufacturer's printed literature.
 - 4. Preprinted product specification data and installation instructions.
- E. Samples
 - 1. Sample submittals shall be physically submitted as specified in Section 01 3300 SUBMITTAL PROCEDURES. Contractor shall enter submittal data information into **Procore** with a copy of the submittal form(s) attached to the sample. Examples of samples include, but are not limited to:
 - 2. Product finishes and color selection samples.
 - 3. Product finishes and color verification samples.
 - 4. Finish/color boards.
 - 5. Physical samples of materials.
- F. Administrative Submittals
 - 1. All correspondence and pre-construction submittals shall be submitted using **Procore**. Examples of administrative submittals include, but are not limited to:
 - 2. Digging permits and notices for excavation.
 - 3. List of product substitutions
 - 4. List of contact personnel.
 - 5. Notices for roadway interruption, work outside regular hours, and utility cut overs.
 - 6. Requests for Information (RFI).
 - 7. Construction progress Schedules and associated reports and updates.
 - a. Each schedule submittal specified in CONSTRUCTION PROGRESS DOCUMENTATION shall be submitted as a native backed-up file (.PRX or .STX) of the scheduling program being used. The schedule will also be posted as a PDF

- file in the format.
8. Plans for safety, demolition, environmental protection, and similar activities.
 9. Quality Control Plan(s), Testing Plan and Log, Quality Control Reports, Production Reports, Quality Control Specialist Reports, Preparatory Phase Checklist, Initial Phase Checklist, Field Test reports, Summary reports, Rework Items List, etc.
 10. Meeting minutes for quality control meetings, progress meetings, pre-installation meetings, etc.
 11. Any general correspondence submitted.
- G. Compliance Submittals
1. Test reports, certificates, and manufacture field report submittals shall be submitted on **Procore** as PDF attachments. Examples of compliance submittals include, but are not limited to:
 - a. Field test reports.
 - b. Quality Control certifications.
 - c. Manufacturer's documentation and certifications for quality of products and materials provided.
- H. Record and Closeout Submittals
1. Operation and maintenance data and closeout submittals shall be submitted on **Procore** as PDF documents during the approval and review stage as specified, with actual set of documents submitted for final. Examples of record submittals include, but are not limited to:
 - a. Operation and Maintenance Manuals: Final documents shall be submitted as specified.
 - b. As-built Drawings: Final documents shall be submitted as specified.
 - c. Extra Materials, Spare Stock, etc.: Submittal forms shall indicate when actual materials are submitted.
- I. Financial Submittals
1. Schedule of Value, Pay Applications and Change Request Proposals shall be submitted on **Procore**. Supporting material for Pay Applications and Change Requests shall be submitted on **Procore** as PDF attachments. Examples of compliance submittals include, but are not limited to:
 - a. Contractors Schedule of Values
 - b. Contractors Monthly Progress Payment Requests
 - c. Contract Change proposals requested by the project owner

END OF SECTION

SECTION 01 3200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Construction Progress Schedule
- B. Construction Manager's Construction Schedule
- C. Submittal Schedule
- D. Daily Construction Reports
- E. Progress Photographs

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 CONSTRUCTION MANAGER'S MASTER CONSTRUCTION SCHEDULE

- A. Upon award of package, Contractor agrees to accept and meet or improve upon the schedule proposed in section **00 3113 PRELIMINARY SCHEDULE** with intermediate handoffs. Each package contractor will be required to participate in schedule coordination meetings with the Construction Manager.
- B. If the bid package contractor does not meet the handoff milestones in the master construction schedule, the bid package contractor shall take measures to increase work forces, increase work hours, initiate revisions to means and methods of construction, and/or other similar measures as required to make up lost time and complete the work in accordance with the construction schedule and remain consistent with project progress and overall construction schedule. Such measures shall be at no additional cost to the Owner. The Construction Manager shall have sole discretion on decisions to accelerate work.
- C. Updating the master construction schedule – Contractors are required to attend and participate in schedule coordination update meetings with the Construction Manager. This will be an opportunity for contractors to further define their scheduled scope of work in conjunction with other trades on site.
- D. Acceptance of revised master construction schedule – After an updated master construction schedule has been issued via Procore, Contractors will have 48 hours to dispute the new schedule. All contractors will be held to the last fully accepted master construction schedule.

3.02 CONSTRUCTION PROGRESS SCHEDULE

- A. Submit preliminary outline to the Construction Manager no later than 48 hours prior to the pre-construction meeting for coordination with Owner's requirements.
- B. Submit revised progress schedule with each application for payment.
- C. Schedules will be electronically submitted through Procore.
- D. Distribute copies of reviewed schedules to project site file, subcontractors, suppliers, and other concerned parties.
- E. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.
- F. Submit computer generated horizontal bar chart with separate line for each major portion of work or operation, identifying the first day of each week.
- G. Show complete sequence of construction activity, identifying work of separate stages and other

logically grouped activities. Indicate early and late start, early and late finish, float dates, and duration.

- H. Indicate estimated percentage of completion for each item of work at each submission.
- I. Participate in joint review and evaluation of schedule with Construction Manager.
- J. Revisions to schedules:
 - 1. Indicate progress of each activity to date of submittal and projected completion date of each activity.
 - 2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
 - 3. Prepare narrative report to define problem areas, anticipate delays, and impact on schedule. Report corrective action taken, or proposed, and its effect including effect of changes on schedules of separate contractors.

3.03 SUBMITTAL SCHEDULE

- A. Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, re-submittal, ordering, manufacturing, fabrications, and delivery when establishing dates.
 - 1. Coordinate submittal schedule with list of subcontractors, the schedule of values, and construction schedule.
 - 2. Submit concurrently with first complete submittal of contractor's construction schedule.

3.04 DAILY CONSTRUCTION REPORTS

- A. Daily Construction Reports: Submitted at weekly intervals.
 - 1. Daily Construction Reports will be submitted to Construction Manager.
- B. Prepare a daily construction report recording the following information concerning events at project site:
 - 1. Count of personnel at Project site
 - 2. Equipment at Project site
 - 3. Material Deliveries
 - 4. High and low temperatures and general weather conditions, including presence of rain or snow
 - 5. Accidents
 - 6. Meetings and significant decisions
 - 7. Unusual events
 - 8. Stoppages, delays, shortages, and losses
 - 9. Meter readings and similar recordings
 - 10. Emergency procedures
 - 11. Orders and requests of authorities having jurisdiction
 - 12. Change orders received and implemented
 - 13. Services connected and disconnected
 - 14. Equipment or system tests and startups
 - 15. Partial completions and occupancies
 - 16. Substantial completions authorized

3.05 PROGRESS PHOTOGRAPHS

- A. Progress photographs will be electronically submitted through Procore.
- B. Preconstruction Photographs: Before starting construction, take photographs of project site and surrounding properties, including existing items to remain during construction, from different

vantage points, as directed by Construction manager.

1. Take additional photographs as required to record existing damage to site, structure, equipment, or finishes.
- C. Periodic Construction Photographs: Take photographs at regular intervals. Select vantage points to show status of construction and progress since last photographs were taken.
- D. Field Completion Construction Photographs: Take photographs after date of Substantial Completion for submission as project record documents. Construction manager will inform of desired vantage points.

END OF SECTION

SECTION 01 3300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Submittals for Review
- B. Submittals for Information
- C. Submittal Procedures
- D. Samples

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product Data
 - 2. Shop Drawings
 - 3. Samples for Selection
 - 4. Samples for Verification
- B. Submit to Construction Manager to forward to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record document purposes.

3.02 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Inspection reports.
 - 5. Manufacturer's instructions.
 - 6. Manufacturer's field reports.
 - 7. Other types indicated.
- B. Submit for Construction Manager, Architect, and Owner's knowledge. No action will be taken.

3.03 SUBMITTAL PROCEDURES

- A. Submittals will be electronically submitted through Procore. Contractor will be invited to join web based program after issue of Notice of Intent to award.
- B. Shop Drawing Procedures:
 - 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
 - 2. Do not reproduce the Contract Documents to create shop drawings.

3. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.
- C. Transmit each submittal with a copy of approved submittal form.
- D. Sequentially number the submittal form. Revise submittals with original number and a sequential numeric suffix.
- E. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- F. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
- G. Schedule submittals to expedite the project and coordinate submission of related items.
- H. For each submittal review, allow 15 days excluding delivery time to and from the contractor.
- I. Identify variations from the Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
- J. When revised for resubmission, identify all changes made since previous submission.
- K. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- L. Submittals not requested will not be recognized or processed.

3.04 **SAMPLES**

- A. Submit to Construction Manager to forward to Architect/Engineer for review for limited purpose for checking conformance with information given and design concept expressed in the Contract Documents.
- B. Samples for selection as specified in product sections:
 1. Submit to Construction Manager to forward to Architect/Engineer for aesthetic, color, or finish selections.
 2. Submit samples of finishes from full range of manufacturer's standard colors, textures, and patterns to Construction Manager to forward to Architect/Engineer for selection.
- C. Submit samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- D. Include identification on each sample, with full project information.
- E. Submit number of samples specified in individual specification sections.
- F. Photograph of submitted samples, along with transmittal sheet, shall be uploaded as a submittal in Procore.

END OF SECTION

SECTION 01 4000

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. References
- B. Quality assurance and control of installation
- C. Tolerances
- D. Defect Assessment
- E. Inspection and testing laboratory services
- F. Manufacturer's field services and reports

1.02 REFERENCES

- A. Conform to reference standard in effect at date of contract.
- B. When required by contract documents, obtain copies of standards.
- C. Should specified reference standards conflict with contract documents request clarification from engineer before proceeding.
- D. The contractual relationship of the parties to the contract shall not be altered from the contract documents by mention or inference otherwise in any reference document.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce work of specified quality.
- B. Comply fully with manufacturer's instructions, including each step in sequence.
- C. Should manufacturer's instructions conflict with contract documents, request clarification from the engineer prior to proceeding.
- D. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform work by persons qualified to produce workmanship of specified quality
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stress, vibration, physical distortion, or disfiguration.

3.02 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with contract documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 DEFECT ASSESSMENT

- A. Replace work or portions of work not conforming to specified requirements.

- B. If, in the option of the Owner, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or recommend adjusted payment.

3.04 INSPECTION AND TESTING

- A. Owner shall include and pay for all required special inspections and testing required by IBC Section 1705, if applicable. This does not include inspections and testing required by other specification sections in this Project Manual. Copies of all testing and inspection reports shall be submitted to the Construction Manager and Design Professional by the testing and inspection agency.
- B. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect, Construction Manager, and contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of contract documents.
 - 4. Immediately notify the Construction Manager and contractor of observed irregularities or non-conformance of work or products.
 - 5. Perform additional testing and inspections required by the Owner
- C. Limits on Testing Agency/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirement of contract documents.
 - 2. Agency may not approve or accept any portion of the work.
 - 3. Agency may not assume any duties of the contractor.
 - 4. Agency has no authority to stop the work.
- D. Contractor responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the work and to manufacturer's facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of products to be tested/inspected.
 - c. To facilitate test/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Construction Manager and laboratory 24 hours prior to expected time for operations requiring testing/inspection.
- E. Re-testing required because of non-conformance to specified requirements shall be performed by the same testing agency on instruction by Architect/Construction Manager.
- F. Re-testing required because of non-conformance to specified requirements shall be paid for by the Contractor.

3.05 MANUFACTURER'S FIELD SERVICES AND REPORTS

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start up of equipment, test, adjust and balance of equipment as applicable and to initiate instructions when necessary.
- B. Individuals are to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to the manufacturers' written instructions.
- C. Submit report in duplicate within 30 days of observation to Construction Manager for review.

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Temporary Utilities
- B. Temporary Sanitary Facilities
- C. Telephone Service
- D. Removal of Utilities, Facilities, and Controls
- E. Temporary Facilities
- F. Equipment
- G. Vehicular Access and Parking
- H. Traffic Regulation
- I. Barriers
- J. Waste Removal

1.02 TEMPORARY UTILITIES

- A. Owner will provide the following:
 - 1. Electrical Power, consisting of connection to existing facilities.
 - 2. Water Supply, consisting of connection to existing facilities.
- B. The Contractor shall pay for installation, maintenance, and removal of temporary utilities. Temporary utilities shall not disrupt the Facility's need for continuous service.

1.03 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.04 TELEPHONE SERVICE

- A. Provide, maintain, and pay for telephone service to field or use a cellular telephone.

1.05 REMOVAL OF UTILITIES, FACILITIES AND CONTROLS

- A. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS

2.01 TEMPORARY FACILITIES

- A. Field Offices: Coordinate with Construction Manager and Owner if applicable.

2.02 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated, with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.01 VEHICULAR ACCESS AND PARKING

- A. Use designated existing on-site roads for construction traffic.
- B. Parking is as directed by Owner.
- C. When site space is not adequate, provide additional off-site parking.
- D. Use of designated existing on-site streets and driveways used for construction traffic is permitted. Track vehicles not allowed on paved areas.
- E. Use of designated areas of existing parking facilities used by construction personnel as permitted.
- F. Do not allow heavy vehicles or construction equipment in parking areas.
- G. Provide and maintain access to fire hydrants, free of obstructions.
- H. Provide means of removing mud from vehicle wheels before entering streets.

3.02 TRAFFIC REGULATION

- A. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.
- B. Flares and lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.
- C. Haul Routes:
 - 1. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
- D. Removal:
 - 1. Remove equipment and devices when no longer required.
 - 2. Repair damage caused by demolition.

3.03 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for Owner's use of site and to protect existing facilities and adjacent properties from damage during construction operations.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

3.04 WASTE REMOVAL

- A. Except for items or materials to be salvaged, recycled or otherwise reused, remove waste materials from project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Waste Disposal Facilities: Provide waste collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

END OF SECTION

SECTION 01 6000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. General product requirements
- B. Product options
- C. Maintenance materials
- D. Transportation and handling
- E. Storage and protections

PART 2 - PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS

- A. Provide new products unless specifically required or permitted by the contract documents.
- B. Do not use products having any of the following characteristics:
 - 1. Made using or containing CFC's or HCFC's
 - 2. Made of wood from newly cut old growth timber.
- C. Where all other criteria are met, contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions
 - 2. If wet-applied, have lower VOC content
 - 3. Are extracted, harvested, and/or manufactured closer to the location of the project
 - 4. Have longer documented life span under normal used
 - 5. Result in less construction waste
 - 6. Are made of vegetable materials that are rapidly renewable

2.02 PRODUCT OPTIONS

- 1. Products specified by reference standards or by description only: Use of any product meeting those standards or description.
- 2. Products specified by naming one or more manufacturers, with or without a provision for substitutions: Use a product of one of the manufacturers named and meeting specifications or submit a request for substitution for any manufacturer not named by the date specified in this project manual. Substitution requests shall be emailed to the Issuing Officer at the email address provided in Instructions to Bidders Section 1.04.

2.03 MAINTENANCE MATERIALS

- 1. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- 2. Deliver to project site; obtain receipt prior to final payment.

PART 3 - EXECUTION

3.01 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.02 STORAGE AND PROTECTIONS

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to the product.
- E. For exterior storage of fabricated products, place on slopped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturers' warranty conditions, if any.
- H. Cover product subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 7300

EXECUTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures
- B. Alteration project procedures
- C. Cutting and patching
- D. Cleaning and protection
- E. Adjusting

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION, PREPARATION, AND GENERAL INSTALLATION PROCEDURES

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misproduction.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to cutting: Examine existing conditions prior to commencing work; include elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.
- G. Clean substrate surfaces prior to applying next material or substance.
- H. Seal cracks or openings of substrate prior to applying next material or substance.
- I. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.
- J. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- K. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- L. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- M. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- N. Make neat transitions between different surfaces, maintaining texture and appearance.

3.02 ALTERATION PROJECT PROCEDURES

- A. Materials: As specified in product sections match existing products and work for patching and extending work.
- B. Employ skilled and experienced installer to perform alteration work.
- C. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- D. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished work.
- E. Remove, cut and patch work in a manner to minimize damage and to provide a means of restoring products and finished to original condition.

- F. Remove debris and abandoned items from area and from concealed spaces.
- G. Refinish visible existing surfaces to remain in renovated rooms and spaces to specified condition for each material with a neat transition to adjacent finishes.
- H. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work to match existing adjacent work in texture and appearance.
- I. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line of division and make recommendation to the Construction Manager. Prior to cutting get the Owner's approval.
- J. Where change of plane of ¼ inch or more occurs, submit recommendation for providing smooth transition to the Construction Manager for review.

3.03 CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements which affect:
 - 1. Structural integrity of element.
 - 2. Integrity of weather-exposed or moisture-resistant elements.
 - 3. Efficiency, maintenance, or safety of element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of owner or separate contractor.
- C. Execute cutting, fitting, and patching to complete work, and to:
 - 1. Fit the several parts together, to integrate with other work.
 - 2. Uncover work to install or correct ill-timed work.
 - 3. Remove and replace defective and non-conforming work.
 - 4. Remove samples of installed work for testing.
 - 5. Provide openings in elements of work for penetrations of mechanical and electrical work.
- D. Execute work by methods to avoid damage to other work and which will provide proper surfaces to receive patching and finishing.
- E. Cut rigid materials using masonry saw or core drill.
- F. Cut masonry and concrete materials using masonry saw or core drill.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work tight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- I. Maintain integrity of wall, ceiling or floor construction; completely seal voids.
- J. Refinish surfaces to match adjacent finishes. Refinish to nearest intersection for continuous surfaces. Refinish entire unit for continuous surfaces for an assembly.
- K. Identify hazardous substances or conditions exposed during the work to the engineer for decision or remedy.

3.04 CLEANING AND PROTECTION

- A. Progress cleaning
 - 1. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
 - 2. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.
- B. Protection of installed work
 - 1. Protect installed work from damage by construction operations.
 - 2. Provide special protection where specified in individual specification sections.
 - 3. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
 - 4. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.
 - 5. Prohibit traffic from landscaped areas.

3.05 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

END OF SECTION

SECTION 01 7700

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Inspections
- B. Substantial Completion
- C. Project Record Documents
- D. Warranties
- E. Operations and Maintenance Manuals
- F. Operations and Maintenance Data for Materials and Finishes
- G. Operations and Maintenance Data for Equipment and Systems
- H. Training
- I. Final Completion
- J. Maintenance

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 INSPECTIONS

- A. Ensure all state inspections have been completed by the authority having jurisdiction.
- B. Upload documentation of all test/inspections to Procore.
- C. Submit a written request for inspection of Substantial Completion. On receipt of request, The Design Professional will either proceed with inspection or notify contractor of unfulfilled requirements. The Design Professional will prepare the Certificate of Substantial Completion after inspection or will notify contractor of items, either on contractor's list or additional items identified by architect that must be completed or corrected before certificate will be issued.
 - 1. Re-inspection: Request re inspection when the work identified in previous inspections as incomplete is completed or corrected.
 - 2. Results of completed inspection will form the basis of requirements for Final Completion.

3.02 SUBSTANTIAL COMPLETION

- A. A substantial completion checklist is attached for reference following this specification section.
- B. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to the Construction Manager through upload to Procore.
- C. Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Submit written certification that contract documents have been reviewed, work has been inspected, and that work is completed in accordance with contract documents and ready for review
 - 2. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the work has not been completed.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Make final changeover of permanent locks and deliver key to the owner. Advise owner's personnel of changeover in security provisions.
 - 5. Complete startup testing of systems.
 - 6. Submit test/adjust, balance records.
 - 7. Terminate and remove temporary facilities from project site, along with mockups, construction tools, and similar elements.

8. Advise owner of changeover in heat and other utilities.
9. Submit changeover information related to owner's occupancy, use, operation, and maintenance.
10. Complete final cleaning requirements, including touch up painting.
11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

3.03 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the work:
 1. Drawings
 2. Specifications
 3. Addenda
 4. Change orders and other modifications to the contract
 5. Reviewed shop drawings, product data, and samples
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alterations utilized.
 3. Changes made by Addenda and modifications.
- F. Record Drawings:
 1. Measured depths of foundations in relation to finish first floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.
 4. Field changes of dimension and detail.
 5. Details not on original contract drawings.
- G. Record Drawings shall be uploaded to Procore in pdf format.

3.04 WARRANTIES

- A. Submit written warranties for designated portions of the work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Submit properly executed warranties in Procore prior to Final Completion.
- C. Verify that documents are in proper form, contain full information, and are notarized.
- D. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- E. Include warranties in operation and maintenance manuals.
- F. Items of work delayed beyond date of Substantial Completion, provide updated submittal after acceptance by Owner, listing date of acceptance as start of warranty period

3.05 OPERATIONS AND MAINTENANCE MANUALS

- A. Format: Submit operations and maintenance manuals in the following format:
 1. Portable Document Format (PDF) electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Owner and upload to Procore.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.

2. Assemble with data arranged in the same sequence as, and identified by the specification sections. Where systems involve more than one specification section, provide separate index for each system.
3. Include project directory listing title and address of project, names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
4. Include Table of Contents listing every item separated by index and specification section.
- B. Source Data: For each product or system, list names, addresses, and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use project record documents as maintenance drawings.
- E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.06 OPERATIONS AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For each product, applied material, and finish:
 1. Product data, with catalog number, size, composition, and color and texture designations.
 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specified products.

3.07 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For each item of equipment and each system:
 1. Description of unit or system, and component parts
 2. Identify function, normal operating characteristics, and limiting conditions
 3. Include performance curves, with engineering data and tests
 4. Complete nomenclature and model number of replacement parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specified products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Include color coded wiring diagrams as installed.
- E. Operating procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- F. Maintenance requirements: Include routine procedure and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- G. Provide servicing and lubrication schedule and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.

- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide contractor's coordination drawings, with color coded piping diagrams as installed.
- M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- O. Include test and balancing reports.
- P. Additional requirements: As specified in individual specification sections.

3.08 TRAINING

- A. Demonstrate operations of systems, subsystems, and equipment.
- B. Train in operation and maintenance of systems, subsystems, and equipment
- C. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- D. Submit written agenda to Construction Manager for approval prior to scheduling training.
- E. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

3.09 FINAL COMPLETION

- A. A final completion checklist is attached for reference following this specification section.
- B. Before requesting final inspection for determining date of Final Completion, complete the following:
 - 1. Complete punch list items.
 - 2. Prepare and submit project record documents, operation and maintenance manuals, damage or settlement surveys, and similar final record information.
 - 3. Deliver tools, spare parts, extra materials, and similar items to location designated by owner. Label with manufacturer's name and model number where applicable.
 - 4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 - 5. All trailers, construction signs, unused, broken or demolition materials have been removed from the site and the premises returned to the original condition in the opinion of the Owner and Design Professional.
 - 6. Submit a final Application for Payment (retainage).
- C. Upon receipt of final payment complete final completion certificate in Procore.

END OF SECTION

Substantial Completion Project Checklist

Date: _____

DAS Project Number: _____

Project Title: _____

Location: _____

Contractor: _____

In order to process the 99% payment (100% pay app less closeout and retainage) on a Capital Project, the Department of Administrative Services needs the following information. Please complete this form and obtain the necessary documents.

Have all state inspections been completed and documentation uploaded to Procore?

(Including but not limited to the following inspections)

Boiler Inspection	☐ Yes	☐ No	☐ N/A
Water Heater Inspection	☐ Yes	☐ No	☐ N/A
Energy Code Inspection	☐ Yes	☐ No	☐ N/A
Building Code Inspection	☐ Yes	☐ No	☐ N/A
Electrical Inspection	☐ Yes	☐ No	☐ N/A
Elevator Inspection	☐ Yes	☐ No	☐ N/A
Other: _____	☐ Yes	☐ No	☐ N/A

☐ Occupancy Permit if applicable

☐ Test and Balance has been performed

☐ Certificate of Substantial Completion in Procore (Consensus Docs 814)

Are there any disputes with the above mentioned vendor which need resolution?

☐ Yes (provide description below) ☐ No

Can payment (less closeout and retainage) be released? ☐ Yes ☐ No

Final Completion Project Checklist

Date: _____

DAS Project Number: _____

Project Title: _____

Location: _____

Contractor: _____

In order to process the 100% payment and Retainage payment on a Capital Project, the Department of Administrative Services needs the following information. Please complete this form and obtain the necessary documents.

Have all Warranties been received? ☐ Yes ☐ No

Have the Operations and Maintenance Manuals been received? ☐ Yes ☐ No

Who is in possession of the O & M Manuals? _____

Has all training been completed? ☐ Yes ☐ No

Have all as-built drawings been scanned and uploaded into Procore? ☐ Yes ☐ No

Have electronic drawing/specification files been transferred to DAS? ☐ Yes ☐ No

Have all Test & Balance reports been received? ☐ Yes ☐ No

Have all punchlist items been corrected? ☐ Yes ☐ No

☐ **573 Notification** (*To be obtained from the general contractor*): Copy of general contractor's notification of application for retainage to all subcontractors and suppliers. General contractor must follow IAC 26 section 23.13.2.

☐ **AIA Form G706 – Contractor's Affidavit of Payment of Debts and Claims**

☐ **AIA Form G706A – Contractor's Affidavit of Release of Liens**

☐ **AIA Form G707 – Consent of Surety Company to Final Payment**

☐ **Certificate of Final Completion in Procore (Consensus Docs 815)**

Are there any disputes with the above mentioned vendor which need resolution?

☐ Yes (provide description below) ☐ No

Can 100% payment and retainage payment be released? ☐ Yes ☐ No

SECTION 01 91 13
MEP COMMISSIONING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Commissioning Objectives.
- B. Roles and responsibilities.
- C. Installation verification, startup, and functional performance testing requirements.
- D. Systems to be commissioned.

1.2 RELATED REQUIREMENTS

- A. The following sections contain commissioning-related activities and requirements:
 - 1. 23 0500 Common Work Results for HVAC
 - 2. Specific Product, Equipment, and Assembly Technical Specification Sections.
- B. Refer to ASHRAE Guideline 0-2013 and NIBS Guideline 3-2012 for commissioning process overview, standard of care, and definitions.

1.3 MEP Cx OBJECTIVES

- A. The primary function of MEP Cx is to serve as the Owner's quality assurance program pertaining to the systems, equipment, and components.
- B. Commissioning is intended to achieve the following specific objectives:
 - 1. Verify and document that systems, equipment, and components are installed in accordance with the Contract Documents and manufacturer's recommendations and/or requirements.
 - 2. Verify and document the functional performance of systems, equipment, and components.
 - 3. Verify continuity between systems, equipment, and components.
 - 4. Verify that operation and maintenance documentation is accurate and complete.
 - 5. Verify that Owner's personnel have received the required training.
- C. The MEP Cx process is not a substitute for the Contractor's installers' quality control procedures and does not diminish or subtract from the Contractor's responsibility to provide a finished and fully functioning system, equipment and/or component in accordance with the Contract Documents.

1.4 MEP Cx ROLES AND RESPONSIBILITIES

- A. OWNER'S MEP COMMISSIONING AGENT (CxA)
 - 1. The Owner shall retain the CxA(s) to lead the MEP Cx effort and to perform reviews of the systems, equipment, and components.
 - 2. The primary role of the CxA shall be to develop and coordinate the execution of the Owner's Quality Assurance Program pertaining to the systems, equipment, components to be commissioned.
 - 3. The CxA shall observe, document, and provide its professional opinion as to whether systems, equipment, and components are installed and functioning in accordance with the Contract Documents and manufacturer's recommendations and/or requirements.
 - 4. The CxA shall attend planning and job-site meetings to obtain information on construction progress as requested by the Owner.
 - 5. The CxA shall review submittals for the purposes of preparing and/or refining the

Functional Performance Testing procedures and to provide comments to the Owner and Design Professional of a technical nature as appropriate.

6. The CxA shall perform periodic construction observation review of Constructors' efforts, for evaluation of workmanship, functional installation and performance of equipment, systems, and components. These observations shall be made at milestone activities, including but not limited to Mock-ups, commencement of system installations, randomly scheduled site reviews, and testing.
7. The CxA shall assist in identifying potential solutions to non-conforming work. Final resolution shall remain the responsibility of the Constructor. Refer to NIBS 3-2012 and/or ASHRAE Guideline 0-2013 for acceptable standard of care.

A. CONTRACTOR'S ADDITIONAL ROLES AND RESPONSIBILITIES

1. The Contractor shall provide all labor, supervision, materials, tools, equipment, and other services, as necessary, to complete the required installation of equipment, systems, and components in accordance with the Contract Documents and manufacturer's recommendations and/or requirements.
2. The Contractor shall ensure that all system, equipment, and component warranty requirements are followed throughout the startup, commissioning, and training process and shall ensure all adjacent equipment, systems and components are compatible.
3. The Contractor shall coordinate, manage, and ensure completion of all MEP Cx documentation.
4. The Constructor shall provide the following to the CxA upon request: Submittals and other documentation requested as deemed necessary,
 - b. Equipment start-up reports and start-up checklists,
 - c. Photographs of installations, in-process and completed work as deemed necessary.
2. The Contractor shall invite the Owner's Representative, Owner's Operations Personnel and CxA to all equipment and system startup as optional attendees. The purpose of this invitation is to familiarize personnel with equipment and systems prior to training and turnover.
3. The GC shall conduct regular commissioning coordination meetings with the Design Professional, Owner's Representative, CxA, and all MEP Subcontractors of commissioned systems, equipment, and components. The purpose of these meetings will be to coordinate schedule, work activities, and deficiency resolution. These meetings shall be independent from the regularly scheduled construction progress meetings.
4. With input from the MEP CxA, the Contractor shall integrate MEP Cx activities into its master construction schedule prior to the installation of any commissioned equipment, systems, and components. Each system, piece of equipment and component to be commissioned shall be identified separately on the Contractor's schedule. At a minimum, the schedule shall identify the following activities and milestones and shall incorporate the MEP CxA scheduled three (3) site visits for review and testing:
 - a. MEP Cx progress meetings.
 - b. MEP Cx equipment, systems, and component pre-installation meetings.
 - c. Geothermal Boring
 - d. Geothermal System Flush and Fill
 - e. Pump Installation

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

- A. The Contractor shall provide all test equipment required for installation, verification, startup, and checkout of systems, equipment, and components. (See Construction Checklist to determine if pre-test is required by Contract Documents.)

- B. Specialty equipment, tools, and instruments necessary to conduct testing (e.g., available only from the manufacturer for a specific piece of equipment) shall be included in the Contractor's bid.
- C. Test equipment shall be of sufficient quality and accuracy to test and/or measure system performance within the specified tolerances. The following minimum requirements apply unless noted otherwise:
 - 1. Temperature sensors and digital thermometers shall have an accuracy of 0.5 °F and a resolution of plus or minus 0.1 °F.
 - 2. Pressure sensors shall have an accuracy of +/- 2.0% of the value range being measured (not full range of meter).
- D. Test equipment shall be calibrated according to the manufacturer's recommendations or within the past year whichever is more stringent. Calibration tags shall be affixed to test equipment or certificates available upon request by the Owner.
- E. The MEP CxA shall provide all specialized test equipment required for Functional Performance Testing to be performed by the MEP CxA or their Testing Agent.

PART 3 EXECUTION

3.1 SYSTEMS TO BE COMMISSIONED

A. MECHANICAL SYSTEMS

- 1. New Geothermal Well Field and Vault
- 2. New Well Field Circulation Pumps (Lead/Lag, two pumps)

B. PLUMBING SYSTEMS

C. BUILDING CONTROLS

- 1. Conduct a 100% check of major equipment and monitoring points, including analog sensor calibration, point-to-point and mapping to workstation graphics, alarm functions, and proper control of operating sequences.
- 2. Conduct a 100% check of each unique system or equipment control sequence.
- 3. Control Points: Verify that the control system was checked and that it is commanding, reporting, and controlling as specified in the construction documents. Verification must include verification of each control point.
- 4. Actuators
 - a. Visually verify 100% of actuators have been adjusted to fully close and open valves.
- 5. Graphic control screens
 - a. Verify 100% of graphic control screens accurately depict the equipment, system, and associated floor plans and proper performance of links between graphic screens.
 - b. Verify 100% of sensors have been calibrated so that the value reported in the control system represents the actual local value.
 - c. Verify control and monitoring points/devices have been properly labeled.
- 6. Control setpoints
 - a. Review trend information of all major control setpoints to ensure stable and accurate control.
- 7. Ensure full integration with existing systems.

3.2 MEP Cx PROCESS

- A. The MEP CxA shall schedule and conduct a commissioning kickoff meeting to be attended by the

Design Professional, Owner's Representative, GC and MEP Subcontractors of items to be commissioned. The purpose of the meeting is to review commissioning requirements, procedures, documentation, and scheduling of the Work.

- B. GC shall submit an MEP specific Quality Control Plan which shall clearly indicate the Constructor's strategy and method for ensuring coordination of MEP Subcontractors, construction sequencing, and Submittal conflict management. Pre-installation meetings shall be clearly identified.
- C. Contractor shall submit product data, manufacturer's material and equipment shop drawings and documentation to the Design Professional per Section 23 05 00 – Common Work Results for HVAC. GC review of Submittals shall be conducted prior to submission to the Owner, MEP CxA and Design Professional.
- D. MEP CxA shall perform the following:
 - 1. Conduct and Technical Design Review at 50% CD and back-check at 95% CD.
 - 2. Provide a Commissioning Specification, 01 91 00, for inclusion in the project documents.
 - 3. Lead and Document a Commissioning Kick-Off Meeting.
 - 4. Review Major Equipment Submittals.
 - 5. Perform Three (3) Site Visits along with a report for each.
 - 6. Commissioning Status Meeting prior to Functional Performance Testing.
 - 7. Functional Performance Testing Procedures
 - 8. Final Commissioning Report Generation
- E. MEP CxA shall participate in periodic MEP Cx coordination meeting(s) for equipment, systems, and assemblies to be commissioned. The meeting shall be to review the coordinated shop drawings and special details indicating assembly integration into adjacent construction as compared to the Contract Documents, but shall also include the following:
 - 1. Confirmation of complete approved product submittals.
 - 2. Review of installation sequence and testing as applicable.
 - 3. Review of installation limitations, i.e. Adjacent Construction, and Storage.
 - 4. Review of Functional Performance Testing procedures, including Constructor, MEP Subcontractor(s) and manufacturer representative reviews and documentation.
 - 5. Review of main project Installation sequence and schedule.
 - 6. In-person participation shall be required of the Owner, Design Professional, MEP CxA, GC, Constructor's and/or MEP's Subcontractor's project manager and lead installer, and others as requested by the Owner.
 - 7. Manufacturer(s) technical representative, Constructor's and/or MEP Subcontractor's testing agency representative (if applicable), adjacent impacted Subcontractor(s) shall be available by conference call.
- F. The MEP CxA shall assist in resolving any issues identified during regular site observations. The total number of contracted site visits by the MEP CxA is three (3). These site observations will be conducted prior to the start of functional testing. Commissioning site observations will be documented with a report and sent to the project team. Site visits will focus on mechanical system installation details to identify potential issues during construction before installation is complete, or systems are filled.
- G. The MEP CxA shall review Request for Information (RFI) and Instruction to Constructor (ITC) at the request of the Owner as it relates to the impact on MEP commissioning and the Owner Project Requirements.
- H. GC shall review the Constructor's and MEP Subcontractor's Construction Checklists (which may require the Constructor to perform pre-testing) for completeness and verify that all documentation requirements have been met.
- I. After confirming MEP equipment, systems and components were installed correctly and the

Construction Checklist(s) have been completed, including all required pre-test, and submitted to the MEP CxA; the GC shall coordinate Functional Performance Testing requirements with the MEP CxA.

- J. The MEP CxA shall witness Functional Performance Testing.
- K. Systems, equipment, and/or components which fail to meet the Functional Performance Testing, Contract Documents or manufacturer requirements shall be corrected by the Contractor and retested at no additional cost to the Owner.

3.3 FUNCTIONAL PERFORMANCE TESTING

- A. All systems to be commissioned shall be tested to ensure full integration with existing systems.
- B. The objective of observations and functional performance testing is to demonstrate and document that system, equipment, and components are installed and perform in accordance with the Contract Documents.
- C. The MEP CxA shall prepare Functional Performance Testing procedures based on the system sequences of operation and the manufacturer's product data.
- D. All tests that will impact the operations of existing building and/or utility systems shall be identified by the GC and coordinated with the Owner's Representative.
- E. The MEP CxA shall witness and document any Functional Performance Testing performed by the Constructor.
- F. The Contractor shall provide the MEP CxA assistance as needed to complete the Functional Performance Testing, including, but not limited to, providing access to equipment and components, including the use of ladders, lifts, scaffolding and platforms, Personal Protective Equipment, removal of access panels, opening of equipment, manipulation or operation of equipment or components, etc.
- G. The MEP CxA shall observe and/or test each system through all modes of operation where there is an expected system response.
 - 1. Normal and Maintenance Operations: Each system shall be tested through all modes and sequences of operation (maintenance, seasonal changes, occupied, unoccupied, warm-up, cool-down, etc.). Testing shall also demonstrate that the system has the required access, etc., for proper maintenance, adjusting, and cleaning.
 - 2. Abnormal, Failure, and Emergency Operations: Each system shall be tested to simulate conditions such as power failure, freezing, low/no flow, deviation from standard operating conditions, human error, etc., to verify proper system responses, shutdowns, alarms and annunciation, and inter-system communications.

3.4 GRAPHIC REQUIREMENTS

- A. General
 - 1. Nomenclature used must be consistent throughout all graphics.
 - 2. When EGC motors with variable speed control software, requiring top end balancer adjustment, controller voltage range shall be adjusted allowing 100% speed output to equal 100% design capacity, unless coordinated with the owner and CxA otherwise.
- B. Graphic title block which is displayed with all graphics, shall display the following:
 - 1. Location Name
 - 2. Date and Time
 - 3. Outside air reference values
- C. Individual Systems or Equipment
 - 1. Must include an attribute for contract equipment tag and physical area of service for

- building management.
- 2. Must match the equipment and components installation exactly.
- 3. Display key integrated equipment points including but not limited to: entering temperature, leaving temperature, current operating capacity, equipment status and general alarm status.
- 4. Tables are used aligning points of like equipment for easy comparisons as space allows
- 5. Control sequence associated points are grouped and with similar naming conventions
- 6. Reset minimum and maximum limits and effective setpoint
- 7. Display flow direction
- 8. Links to downstream equipment summaries (see below)

3.5 DEFICIENCIES

- A. The terms "failure", "deficiency" and "non-compliant" shall be used interchangeably and shall be defined as any condition in the installation or performance of a system, equipment and/or component that does not comply with the Contract Documents or manufacturer installation instructions.
- B. MEP CxA shall maintain a MEP Cx Action Items Log that shall contain any items that do not appear to meet the intent of the Contract Documents or manufacturer installation instructions. Digital images of non-compliant conditions shall be included as needed. Additionally, items for potential improvement may be included on the log.
 - 1. Deficiencies identified on the Action Items Log shall only include those items which are associated with completed installations and shall not include in-progress Work unless obvious errors are present.
- C. MEP CxA shall update and issue the Action Item Log within two (2) business days following a site visit. Items on the Action Item Log shall be corrected by the Constructor and MEP Subcontractor(s) in a timely manner, and prior to Substantial Completion. Action Items may be added to the Substantial Completion Punch List at the discretion of the Owner.
- D. Costs associated with non-compliant Work shall be assigned to the Constructor.
 - 1. Constructor's incomplete or inaccurate Construction Checklists shall be considered cause for retesting and/or re-review by the MEP CxA and costs associated with retesting and re-review shall be the Constructor's expense.
 - 2. Non-compliant items or deficiencies identified during a MEP CxA review shall be considered cause for re-review by the MEP CxA, at the Constructor's expense.
 - 3. 10% failure rate of any Functional Performance Test sampling shall be cause for retesting 100% of similar systems, equipment, or components.
 - 4. The costs assigned to the Constructor due to non-compliant Work outlined above shall include but not be limited to MEP CxA travel, re-review, re-testing, re-scheduling, or other incurred costs.

END OF SECTION

**SECTION 23 0500
COMMON WORK RESULTS FOR HVAC**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. The work shall include the furnishings of systems, equipment and materials specified in this Division and as called for on the Mechanical Drawings to include supervision, quality control, operation, methods and labor for the fabrication, installation, start-up and tests for the complete mechanical installation. The work shall also include the furnishing of necessary hoisting facilities to set materials and equipment in place and the furnishing of any scaffolding and transportation associated with this work.
- B. Examine the project site and become familiar with existing conditions which will affect the work. Review the drawings and specifications of other trades and take note of conditions to be created which will affect the work. All conditions shall be considered in the preparation of bids; no additional compensation will be made on the behalf of this Contractor.
- C. Provide labor necessary to demolish the existing mechanical system as shown on the drawings, as described in Part 3, Existing Conditions, or as required.
- D. Where noted on the drawings or where called for in other sections of the specification, the Contractor for this division shall install equipment furnished by others, and shall make required service connections. Verify with the supplier of the equipment the requirements for the installation. This contractor shall be responsible for the removal and installation of railings, piping, ductwork, louvers, etc. as required to install new equipment. Coordinate shipping splits for all equipment provided by this contractor.

1.2 DAMAGE

- A. The Contractor shall be responsible for damage to the work of other trades or to the building and its contents, caused by equipment installation.

1.3 PERMITS AND INSPECTIONS

- A. Obtain and furnish necessary permits and inspection certificates for material and labor furnished. Permits and certificates shall be obtained from the proper inspection authorities. The cost of permits, certificates and fees required in connection with the installation shall be borne by the Contractor, unless otherwise noted in the detailed contractual description preceding these specifications. Where applications are required for the procuring of utility services to the building, see that such application is properly filed with the utility, and that information required for such an application is presented to the extent and in the form required by the utility company.

1.4 CODES AND STANDARDS

- A. Applicable provisions of the following codes and standards are hereby imposed on a general basis for the mechanical work (in addition to specific applications specified by individual work sections of these specifications):
 - 1. ANSI Pressure Piping Standards (B31)
 - 2. ASHRAE Safety Code for Mechanical Refrigeration (ANSI B9.1)
 - 3. AWWA Standards
 - 4. ASME Boiler and Pressure Vessel Code and State Boiler Code
 - 5. American Gas Association
 - 6. AWS Standards for Welding

7. National Electrical Code
 8. Local and/or State Plumbing, Mechanical and Building Codes
 9. Occupational Safety and Health Act (OSHA)
 10. International Energy Conservation Code 2012
 11. Uniform Plumbing Code
 12. International Mechanical Code
 13. NFPA Standards and Pamphlets
- B. If any work indicated on the drawings or specified herein conflicts in any way with any of the rules and regulations of the above authorities, the Contractor shall notify the Architect/Engineer in writing 72 hours before bids are opened. In the event the Contractor fails to notify the Architect/Engineer and changes are required by said conflicts, the Contractor shall make such changes as are required without additional cost to this Owner.
- C. Installations must be safe in every respect, and must not create a condition which will be harmful to building occupants; to operating, installing or testing personnel; to workmen; or to the public. The contractor for each installation shall be solely responsible for providing installations which will meet these conditions. If the Contractor believes that the installation will not be safe for all parties, report these beliefs in writing to the Architect/Engineer before any equipment is purchased or work is installed, giving recommendations. The Architect/Engineer will work out required changes and adjustments in contract price where adjustments are warranted.

1.5 DRAWINGS

- A. A complete set of drawings including civil, architectural, structural, mechanical, and electrical drawings shall be on the site at all times. Prior to installing any of the work, check the drawings for dimensions and see that the work does not interfere with clearance required for ceilings, beams, foundations, finished columns, pilasters, partitions and electrical equipment as shown on the drawings and details. After work is installed and it develops that interferences occur which have not been called to the Architect/Engineer's attention before the installation, the Contractor shall, at his own expense, make such changes in his work as directed by the Architect/Engineer.
- B. The contract drawings for mechanical work are in part diagrammatic, intended to convey the scope of work and indicate general arrangement and approximate sizes and locations of equipment and materials. Where job conditions require reasonable changes in indicated locations and arrangement, the Contractor shall make such changes as directed by the Architect/Engineer, without additional cost to the Owner.
- C. Because of the scale of the drawings, certain basic items such as pipe fittings, access panels, and sleeves may not be shown; but where such items are required by other sections of these specifications or where they are required by the nature of the work, they shall be furnished and installed. Rough-in dimensions and locations shall be verified with the supplier of equipment furnished by other trades, or by the Owner, prior to the time of roughing-in.
- D. Equipment specification may not deal individually with minute items required such as components, parts, controls and devices which may be required to produce the equipment performance specified, or as required to meet the equipment warranties. Where such items are required, they shall be included by the supplier of the equipment, whether or not specifically called for.
- E. The drawings and the specifications are cooperative and supplementary. It is the intent of both said drawings and specifications to cover all mechanical requirements in their entirety as nearly as possible. The Contractor shall closely check the drawings and specifications for any obvious errors or omissions and bring any such condition to the attention of the Architect/Engineer prior to the receipt of bids, in order to permit clarification by means of a mailed Addendum. If there is no question prior to the bid proposal date, the Architect/Engineer shall assume that the drawings and

specifications are complete and correct and will expect the intent of said documents to be complied with, and the installation to be complete in all respects, according to said intent.

- F. Locate equipment which must be serviced, operated or maintained in fully accessible positions. Minor deviations from the contract drawings may be made to allow for better accessibility, but changes of magnitude, or which involve extra cost, shall not be made without prior approval. Ample space shall be allowed for removal of parts that may require replacement or service in the future.

1.6 RESPONSIBILITY

- A. The Contractor's responsibility shall not end with the installation and connecting of the various apparatus. It shall include the services of an experienced superintendent, who shall be constantly in charge of the work, together with the qualified journeymen, helpers and laborers required to properly unload, install, connect, adjust, start, operate and test the work involved, including equipment and materials furnished by other trades or by the Owner, until such time as the entire mechanical installation functions properly in every detail.

1.7 COORDINATION

- A. Coordinate the work with other trades prior to installation.
- B. No piping, ducts or equipment foreign to the electrical equipment or architectural appurtenances shall be run over the top of any electrical panels or electrical equipment, in accordance with NEC 110-16 and 384-4. This does not prohibit sprinkler protection for the installation.
- C. The determination of quantities of material and equipment required shall be made from the drawings. Schedules on the drawings and in the specifications are completed as an aid, but where discrepancies arise, it shall be the Contractor's responsibility to provide the required quantity.
- D. Where the specifications state that equipment shall be furnished, installed or provided, it shall be understood to mean this Contractor shall furnish and install completely, unless it is specifically stated that the equipment is to be furnished and installed by others.
- E. The Architect/Engineer reserves the right to determine space priority of the contractors in the event of interference between the piping and equipment of the various contractors. Conflicts between the drawings and specifications, or between requirements set forth for the various trades, shall be called to the attention of the Architect/Engineer. If clarification is not asked for prior to the taking of bids, it will be assumed that none is required, and that the Contractor has submitted his bid in conformance with plans and specifications as issued and that no interference exists.
- F. No piping, ducts or equipment foreign to an elevator hoistway and machine room shall be run inside the hoistway and machine room in accordance with NEC 620-37 and ASME A17.1, 102.2.

1.8 GUARANTEE AND MAINTENANCE

- A. Materials and equipment shall be guaranteed to be free from defects and to be new equipment; no secondhand, used or salvaged equipment will be allowed.
- B. Keep the entire portion of the work in repair, without additional cost to the Owner, so far as defects in workmanship, apparatus, material or construction are concerned for one (1) year from the date of final acceptance, except as otherwise specified herein.
- C. Equipment, which fails to meet performance ratings as specified and shown on the drawings, shall be removed and replaced by new equipment that meets the specified requirements, without additional cost to the Owner.
- D. Materials and workmanship shall be subject to the review of the Architect/Engineer, in whose presence various tests shall be made as required by these specifications.

PART 2 PRODUCTS

2.1 SUBMITTAL PROCESS

- A. Submit shop drawings and catalog data for mechanical equipment specified in Division 23 in accordance with Division 01.
- B. Submittal data for mechanical equipment shall consist of shop drawings and/or catalog cuts showing technical data necessary to evaluate the material or equipment to include dimensions, wiring diagrams, performance curves, rating, control sequence, and other descriptive data necessary to describe fully the item proposed and its operating characteristics. Shop drawings shall be submitted on equipment and materials as required by the specifications.
- C. Approval of materials, including alternate or substitute items, shall be obtained in writing from the Architect/Engineer, verbal approval will not be considered binding.
- D. Shop drawings shall be submitted and shall have been signed, checked, approved, and initialed by the Contractor prior to submittal to the Architect/Engineer. The Architect/Engineer will review shop drawings to aid in interpreting the plans and specifications, and will in so doing assume that the shop drawings conform to specified requirements set forth in this specification. The approval of the shop drawing by the Architect/Engineer does not relieve the Contractor of the responsibility of complying with elements of the specification. The name of the job, Architect/Engineer, location, and specification section shall appear on all pages of shop drawings. Equipment marks (such as EF-1, RTU-1) shall be indicated for each item.
- E. At the completion of the job, furnish three (3) copies of parts lists, operating and maintenance instructions, and manuals organized and bound, in three books.
- F. At the completion of the project, prepare and submit to the Owner record drawings showing the location of piping and ductwork. Drawing shall give accurate dimensions of such equipment for future use by the Owner. This drawing shall be submitted as soon as work is completed and before authorization of final payment.

2.2 SUBCONTRACTORS AND MATERIALS

- A. Submit to the Architect/Engineer for review, when requested, a list of subcontractors, materials and equipment proposed to be used. The list must be reviewed by the Architect/Engineer before this Contractor may enter into any sub-contractual agreement. Equipment, materials, and devices, etc. shall be subject to the review of the Architect/Engineer, whether or not said items are herein specified.

2.3 STANDARDS OF MATERIALS AND WORKMANSHIP

- A. Materials shall be new, complete with manufacturer's guarantee or warranty, and shall be as listed by Underwriters Laboratories (UL), Inc., Air Movement and Control Association (AMCA), American Gas Association (AGA), Air Conditioning and Refrigeration Institute (ARI), etc., if a standard has been established by that agency for the type of material.
- B. Materials shall also comply with applicable standards of the National Electrical Manufacturer's Association, National Board of Fire Underwriters, National Fire Protection Association, National Safety Council, National Bureau of Standards, the National Electrical Code and the Williams-Steiger Occupational Safety and Health Act of 1970. Such standards are hereby made a part of these specifications.
- C. Work shall be performed by workmen skilled in the particular craft, shall be executed in a workmanlike manner, and shall present a neat mechanical appearance when completed. Align, level and adjust equipment for satisfactory operation, and install so that connecting and disconnecting of piping and accessories can be made readily and so that parts are easily accessible for inspection, operation and maintenance. Methods and techniques of installation shall be subject to the review of the Architect/Engineer.

- D. Materials shall be the standard product of a reputable manufacturer regularly engaged in the manufacture of the specific product. Materials of the same type of class shall be the products of one manufacturer. For example, fans shall be from the same manufacturer and pumps from the same manufacturer.
- E. Materials shall be protected from damage, and stored indoors or protected from the weather at all times, unless other storage arrangements are approved by the Architect/Engineer.
- F. Bearing lubrication fittings shall be as recommended by the manufacturer and shall be extended, where necessary, to an accessible location.
- G. Material and equipment shall be installed in strict accordance with the manufacturer's recommendations.

2.4 MATERIAL SUBSTITUTIONS

- A. Proposals as submitted shall be based on the products specifically named in the specification or on the drawings. Material or equipment by manufacturers other than those specified may be used only by permission of the Architect/Engineer. Such permission for substitution must be requested, in writing in accordance with Division 01.
- B. The Architect/Engineer reserves the sole right for the approval of proposed material or equipment, and the phrase, "or approved equivalent", used in these specifications, or on the drawings, shall be interpreted to mean an equivalent approved by the Architect/Engineer.
- C. Changes required by alternate equipment shall be made at no additional cost to the Owner; and costs incurred by other trades, public utilities or the Owner, as a result of the use of such equipment, shall be the responsibility of the Contractor.
- D. Furnish to the Architect/Engineer, when requested, samples of proposed material or equipment substitutions. These samples shall remain with the Architect/Engineer as long as needed.
- E. Identify the differences in alternate material or equipment as compared to that specified, and indicate the benefits to the project as a result of selecting the alternative.
- F. The Architect/Engineer reserves the right to refuse approval of equipment which does not meet the specification, in their opinion, or of equipment for which no local experience of satisfactory service is available. The Architect/Engineer further reserves the right to reject equipment for which maintenance service and the availability of replacement parts is questionable.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

- A. Examine the existing buildings and grounds and become familiar with the conditions as they exist, or that will in any manner affect the work under this contract. No allowance will be made subsequently, in this connection, on behalf of the Contractor for any error or negligence by the Contractor.
- B. Existing equipment, such as duct or pipe, in or on the existing building and grounds which is to be replaced, or which interferes in any way with the remodeling of the existing facilities and/or installation of new equipment, shall be removed from the premises or relocated by this Contractor, as directed by the Architect/Engineer. Do not remove from the premises, any equipment that may have maintenance value to the Owner without permission of the Owner. Equipment, duct or pipe not to be reused shall be removed from the premises, unless otherwise noted herein or shown on the drawings.
- C. Where existing equipment is removed or changed, all duct and pipe no longer in service shall be removed and stubs plugged as directed by the Architect/Engineer. Building surfaces damaged and openings left by removal of equipment shall be repaired by the proper trades and paid for by this Contractor, unless otherwise noted on the drawings. The cutting and fitting shall be done by this Contractor. The cutting of floor, ceiling or wall surfaces shall be done by this Contractor with extreme care, in order to avoid any disrupting or damage of existing utility services which may be

encountered. Coordinate with other trades and with the Construction Manager to minimize the damage to the building in order to reduce the amount of patching required.

- D. Where new openings are cut and concealed piping is encountered, such items shall be removed or relocated as required. Where systems to be removed stub through floors, walls or ceilings, openings shall be patched so that no evidence of the former installation remains.
- E. Existing active services (water, gas, sewer, electric), when encountered, shall be protected against damage. Do not prevent or disturb operation of active services that are to remain. If active services are encountered which require relocation, make request to authorities with jurisdiction for determination of procedures. Where existing services are to be abandoned, they shall be terminated in conformance with requirements of the utility or municipality having jurisdiction.
- F. The location, size and elevation of underground utilities shown on the drawings are in accordance with data supplied by the Owner and/or the various utility companies. The Contractor shall verify this data and shall report any discrepancies to the Architect/Engineer before submitting his bid.

3.2 INTERRUPTION OF SERVICE

- A. Changes in service shall be made so as to provide a minimum of interference with the operation of services in the building. When changes require shutdown of building services, notify the proper building authorities no less than 24 hours in advance and obtain approval from these authorities before making changes. Such notices shall give duration and nature of shutdown. Temporary arrangements shall be approved by the Architect/Engineer and/or Owner.
- B. Any and all interruptions to building services shall be in accordance with Division 01.

3.3 OPENINGS, CUTTING, AND PATCHING

- A. The Contractor shall coordinate with the Construction Manager and Owner the placing of openings in the new structure, as required for the installation of the mechanical work.
- B. Furnish to the Construction Manager the accurate locations and sizes for required openings. This shall not relieve this Contractor of the responsibility of checking to assure that proper size openings are provided. When additional patching is required due to this Contractor's failure to inspect this work, this Contractor shall make arrangements for the patching required to properly close the opening, to include patch painting. This Contractor shall pay any additional cost incurred in this respect.
- C. When cutting and patching of the structure is made necessary due to this Contractor's failure to install piping, ducts, sleeves or equipment on schedule, or due to this Contractor's failure to furnish, on schedule, the information required for the leaving of openings, it shall be this Contractor's responsibility to make arrangements for this cutting and patching. This Contractor shall pay any additional cost incurred in this respect.
- D. Provide cutting and patching and patch painting in the existing structure, as required for the installation of the work. Furnish lintels and supports as required for openings. Cutting of structural support members will not be permitted without prior approval of the Architect/Engineer. Extent of cutting shall be minimized. Use core drills, power saws or other machines which will provide neat, minimum openings. Patching shall match adjacent materials and surfaces and shall be performed by craftsmen skilled in the respective craft required.

3.4 EXCAVATION AND BACKFILL

- A. Refer to Drawings and Section 23 8144 Horizontal Ground Source Heat Exchanger for requirements for trench excavation, backfill, and compaction.

3.5 CONCRETE AND MASONRY WORK

- A. Concrete work included herein or shown on the drawings shall be done only by experienced cement finishers. Brickwork, where included, shall be laid only by experienced brick masons. Brick shall be of uniform size, hard burned, and shall be laid in cement mortar, except for patch work at a location where cement and lime mortar has previously been used. Exposed, finish brickwork shall match existing brickwork as closely as practical and shall be to the satisfaction of the Architect/Engineer and Owner.
- B. Concrete bases and pads for mechanical equipment will be furnished by Contractor. This Contractor shall coordinate size and location with Construction Manager/Owner.
- C. Furnish equipment anchor bolts and be responsible for their proper installation and accurate location.

3.6 ROOF OPENINGS

- A. Roof openings required by this Contractor that are not shown on the Structural or Architectural Drawings shall be cut and (if necessary) reinforced by an experienced roofing contractor.
- B. Roof penetrations for duct and piping shall be through curbed roof openings. Equipment supports shall be by curbed and flashed runners meeting current National Roofing Contractor Association (NRCA) standards and details. Pitch pockets, pitch pans, and wood blocking are not acceptable.
- C. All roof work shall be completed such that it does not void any existing roof warranty.

3.7 PAINTING

- A. The finish of any item that has been marred, scratched or damaged in any way by this Contractor shall be repainted at the expense of this Contractor, and to the satisfaction of the Architect/Engineer and the Owner.

3.8 CLEANING

- A. Keep the premises clean of all debris, caused by the work as described in DIVISION 01.
- B. At the conclusion of the construction, the site shall be thoroughly cleaned of all rubble, debris and unused material and shall be left in good order. Closed off spaces shall be cleaned of waste such as material, cartons, and wood frame members used in the construction.

3.9 WIRING FOR MECHANICAL EQUIPMENT

- A. The electrical contractor will provide power to and connection of motors and equipment furnished by this Contractor. Where disconnect switches are not specified to be furnished with the equipment, the electrical Contractor will furnish disconnect switches for equipment furnished by this Contractor.
- B. Provide integral wiring, alarm wiring, control wiring, temperature control wiring and interlock wiring for equipment furnished, whether or not such wiring is furnished by the equipment vendor.
- C. Except where other Sections call for starters to be furnished by manufacturers as part of their equipment, the electrical contractor will furnish motor starters for motors furnished by this Contractor.
- D. Furnish to the electrical contractor, shop drawings and a schedule for motors and other mechanical equipment furnished, which require electrical services. The schedule shall include the locations for rough-ins, electrical loads, size, and electrical characteristics for services required.
- E. Additional costs incurred, where motors or equipment furnished by this Contractor require larger services or services of different electrical characteristics than those called for on the Electrical Drawings, due to the Contractor furnishing substitute equipment, shall be paid for by this Contractor.
- F. Review the Electrical Drawings and call to the attention of the Architect/Engineer, prior to bidding, omissions of electrical services required for equipment.

- G. Mechanical equipment which requires fuse protection, to maintain UL listing, shall be coordinated with the electrical contractor to provide such protection.

3.10 MOTORS

- A. TEFC and ODP motors for equipment supplied by this contractor shall meet or exceed the listed values when tested in accordance with IEEE Standard 112 Method B as defined by NEMA Standard MG 1-12.6C. Efficiency values listed are based on NEMA Premium Efficiency Motors of NEMA MG 1-2003, Table 12-12 at 1800 RPM:

HP	ODP	TEFC
1	85.5	85.5
1.5	86.5	86.5
2	86.5	86.5
3	89.5	89.5
5	89.5	89.5
7.5	91.0	91.7
10	91.7	91.7
15	93.0	92.4
20	93.0	93.0
25	93.6	93.6
30	94.1	93.6
40	94.1	94.1
50	94.5	94.5
60	95.0	95.0
75	95.0	95.4
100	95.4	95.4
125	95.4	95.4
150	95.8	95.0
200	95.8	95.0

- B. All motors that are indicated to be used with Variable Frequency Drives (VFDs) shall be inverter duty rated. Coordinate all motor requirements with the electrical contractor.

3.11 PROTECTION

- A. Special care shall be taken for the protection of equipment furnished by this Contractor. Equipment and material shall be protected from elements such as weather, painting and plastering until the project is completed. Damage from rust, paint or scratches shall be repaired as required to restore equipment to original condition.
- B. Protection of equipment during the plastering and painting of the building shall be the responsibility of the contractor performing that work, but this shall not relieve this Contractor of the responsibility of checking to assure that adequate protection is being provided.

- C. Where the installation or connection of equipment requires this Contractor to work in areas previously finished by other contractors, this Contractor shall be responsible that such areas are protected and are not marred, soiled or otherwise damaged during the course of such work. This Contractor shall arrange with the other contractors for repairing and refinishing of such areas which may be damaged.
- D. When heavy materials must be placed upon or transported over the roof deck, sheeting shall be placed to distribute the weight and support such materials. Any damage shall be immediately corrected at no cost to the Owner.

3.12 ASBESTOS IDENTIFICATION AND CONTROL

- A. In the event that suspected asbestos containing material (ACM) is encountered during the course of the work, cease operations in the immediate area and promptly notify the Architect/Engineer. Suspected materials will then be sampled and analyzed by the Owner. Should ACM be identified, the Owner's Representative will direct the procedures for abatement, either by subcontract to the Contractor or separate contractor. During abatement operations, cease operations in the immediate area of the abatement. Operations in other areas of the project may be performed, but care must be taken to control dust to avoid contamination of the abatement containment or air monitoring samples. The Contractor shall coordinate activities with the asbestos abatement contractor.
- B. Should no ACM be identified, operations may be resumed. Delays caused by identification, analysis or abatement may be added to the time of the contract, at the discretion of the Architect/Engineer by Change Order.

3.13 NOISE AND VIBRATION

- A. Be responsible for the installation of all equipment in such a manner as to control the transmission of noise and vibration from any installed equipment or system, so that the sound level does not exceed NC35 in any occupied space. Be responsible for the correction of any objectionable noise in any occupied area due to improperly installed equipment.

3.14 TESTS AND DEMONSTRATIONS

- A. Systems shall be tested and placed in proper working order prior to demonstrating systems to the Owner.
- B. Prior to acceptance of the mechanical installation, demonstrate to the Owner or his designated representatives essential features and functions of all systems installed, and instruct the Owner in the proper operation and maintenance of such systems.
- C. Furnish the necessary trained personnel to perform the demonstrations and instructions, and arrange to have the manufacturer's representatives for the system present to assist with the demonstrations. The Owner and Contractor shall each sign a certification stating that the training has been performed and the Owner accepts same.

3.15 UTILITY REBATE APPLICATIONS

- A. This contractor shall be responsible for gathering information necessary for completing local utility rebate applications, and submitting to the proper utility companies for gas and electric rebates. Potential rebates include high efficiency gas boilers, thermostats, timeclocks, motors, and other items furnished by this mechanical contractor.

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SECTION 23 0523
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Provide equipment, materials, labor, and supervision necessary to install valves as indicated on drawings and in schedules, and herein specified.
- B. Valves of the same type shall be of a single manufacturer. Valves shall conform to ANSI standard dimensions.

1.2 SUBMITTALS

- A. Submit detailed Shop Drawings and Product Data clearly indicating manufacturer, model, size, dimensions and pressure rating.

1.3 PACKAGING

- A. Valves shall be furnished or provided with protective packaging to prevent damage during shipping or on the job site.

1.4 DEFINITIONS

- A. S.P. - Saturated Steam Pressure
- B. W.P. - Working Pressure
- C. W.O.G. - Water, Oil, Gas Pressure
- D. BR - Bronze
- E. I.B.B.M. - Iron Body, Bronze-Mounted
- F. O.S.&Y. - Outside Screw and Yoke
- G. N.R.S. - Non-Rising Stem
- H. R.S. - Rising Stem
- I. M.S.S. - Manufacturer's Standardization Society of the Valve and Fitting Industry, Inc.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products manufactured by one of the following, as listed for each valve type, or Engineer-approved equivalent.

	<u>Valve Type</u>	<u>Approved Manufacturer</u>
1.	Gate and Check Valves	Crane, Stockham, Lunkenheimer, Hammond Industrial Series, NIBCO, Milwaukee
2.	Ball Valves	Jamesbury, Apollo, Jenkins, Milwaukee, Watts, Worcester, Powell, or NIBCO
3.	Butterfly Valves Lined:	Keystone, Demco, Milwaukee, Centerline, NIBCO High Performance, Jamesbury, Dezurik, Durco

2.2 GENERAL

- A. Materials: Discs, gaskets, packings, seats, diaphragms and lubricants shall conform to recommendations of the valve manufacturer for the intended use.
- B. Body materials, unless otherwise stated:
 - 1. Bronze: 125-150 lbs., ASTM B62
 - 2. Iron: 200-300 lbs., ASTM B61
 - 3. Cast Iron: ASTM A126, Class B
 - 4. Cast Iron: ASTM 448
 - 5. Ductile Iron: ASTM A395
 - 6. Cast Steel: ASTM A216

2.3 GATE VALVES

- A. Provide gate valves complying with MSS SP-80. Gate valves shall be as follows unless otherwise indicated on the drawings.
 - 1. 2 in. and Smaller: 125-lb. saturated steam, screwed, solid wedge disc, and all parts ASTM B62 grade bronze except wheel and packing.
 - 2. 2-1/2 in. through 16 in.: 125-lb. saturated steam, O.S.&Y., flanged ends, bronze seats and stem, double-seated solid wedge disc, iron body and bonnet.
 - 3. Steam lines over 16 in.: 150-lb. saturated steam, O.S.&Y., cast steel body, solid wedge disc, all carbon steel construction.
- B. Equip valves with packing suitable for intended service.
- C. Provide gate valves designed such that back seating protects packing and stem threads from fluid when valve is fully opened. Equip valves with gland follower.

2.4 CHECK VALVES

- A. Check valves for water, steam, and air shall be as follows unless otherwise shown on the drawings:
 - 1. 3 in. and smaller: 200-lb. saturated steam, swing type, threaded, bronze body meeting ASTM B62, pressure tight removable disc, hinge bumper to prevent sticking open, can be mounted horizontally or vertically.
 - 2. Over 3 in.: 125-lb. saturated steam, swing check, flanged iron body meeting ASTM A126 Class B design to prevent disc sticking open, removable disc, bronze trimmed for steam or water, otherwise all iron construction.
 - 3. Non-slam type for pump discharge duty – 2-1/2 in. and larger: I.B.B.M., flanged, class 300, wafer style.

2.5 BALL VALVES

- A. 2 in. and smaller: ASTM B584 bronze body, 2-piece, full port stainless steel ball, screwed or soldered ends with teflon seats and seals, blow out proof stem, tee or lever handle rated to 150 SWP/600W06.
- B. Over 2 in.: Carbon semi-steel or ductile iron body, 2-piece, full port stainless steel ball, ANSI rated flanged ends with Teflon seats and lever handle.

2.6 BUTTERFLY VALVES

A. Lined

1. Disc - Aluminum bronze ASTM B148 Class 9B or ASTM B584 Alloy 876 for chilled, heating and condenser water, air, and fuels.
2. Seat
 - a. Buna N hardback type ASTM D735-SB620AABE1E3G for chilled, hot and condenser water, air, fuels.
 - b. Hypalon ASTM D735-SC620A1 BF1JL for chemically treated water and water – 10° F to +180° F.
 - c. EPT ASTM D735-RA620A BF2JL for hot water, low-pressure steam +190° F to +230° F.
 - d. Stem - Stainless steel dry journal type QQ-S-763.
 - e. Bodies – Semi-steel; ASTM A126 Class B; cast iron, ASTM 448; ductile iron. ASTM A536; or cast steel, ASTM A216. On insulated piping, butterfly valves shall have extended neck suitable for 2 in. thick insulation.
 - f. Actuators - Lever handle with infinite position lever with positive locking feature on valve sizes 2 in. through 5 in. Geared hand wheel on valve sizes 6 in. and larger. Furnish chain operator for valve 6 inches and larger, and located 8 feet or more above the finished floor in mechanical equipment rooms.
 - g. General Specifications.
 - 1) Butterfly valves may be of flanged, wafer, or lug type (lugs drilled and tapped). Grooved valve couplings may be used where grooved piping is applied.
 - 2) Elastomer seats shall be bonded to a rigid backup ring, be field replaceable, and of the types listed above.
 - 3) The disc shall be aluminum bronze of the floating type with no external disc to stem fasteners. Drive is accomplished by a square stem engaging in a broached disc.
 - 4) Stems shall be stainless steel of the one-piece type, completely sealed from line flow.
 - 5) Working Pressures: 28 in. vacuum to 250 lb. working pressures, 300 lb. test, with bubble-tight end of line shutoff.
 - 6) Dead end service at full pressure without the need of a downstream flange.

B. High Performance

1. Disc - 316 S.S. eccentric disc.
2. Seat - One-piece flexible TFE polymer seat.
3. Stem - 17-4 pH stainless steel with TFE shaft seal wrapped in stainless steel; Chevron type TFE packing.
4. Bodies - ANSI class 150 carbon steel; nickel aluminum bronze; 316 stainless steel; Monel Alloy 20.
5. Actuators - Lever handle with infinite position lever with positive locking feature on valve sizes 2 in. through 5 in. Geared hand wheel on valve sizes 6 in. and larger. Geared hand

wheel on valve sizes 6 in. and larger. Furnish chain operator for valve 6 inches and larger, and located 8 feet or more above the finished floor in mechanical equipment rooms.

6. General Specifications

- a. Butterfly valves may be of flanged, wafer, or lug type (lugs drilled and tapped). Grooved valve couplings may be used where grooved piping is applied.
- b. Elastomer seats shall be bonded to a rigid backup ring, be field replaceable, and of the types listed above.
- c. The spherical segmented wafer disc shall be aluminum bronze of the floating type with no external disc to stem fasteners. Drive is accomplished by a square stem engaging in a broached disc.
- d. Stems shall be of the two-piece type, completely sealed from line flow.
- e. Working Pressures: 28 in. vacuum to 150 lb. working pressures, 300 lb. test, with bubble-tight shutoff.

2.7 DRAIN VALVES (HOSE BIBBS)

- A. Soldered or Threaded Ends: Bronze body, screwed bonnet, rising stem, composition disc, 3/4 in. threaded hose outlet connection; 125 psi, maximum pressure rating.

2.8 HAND WHEELS, OPERATORS, HANDLES, AND WRENCHES

- A. Provide suitable hand wheels for gate, globe and drain valves.

PART 3 EXECUTION

3.1 VALVE LOCATIONS – GENERAL

- A. Unless otherwise noted, shutoff valves shall be provided at all equipment connections (supply and return where applicable) for the following piping: pump suction and discharge, water, air, steam, condensate, fuel and gas and drain lines (except on gravity drains from pans). Equipment connections include such items as coils, condensers, tanks, pumps, heat exchangers, and similar items.
- B. Check valves of the non-slam type shall be installed at the discharge of pumps unless otherwise shown on the drawings.
- C. Install isolation valves at each branch off of horizontal mains and vertical risers.
- D. All valves 4 in. and larger used for dead end service (future connections) shall be butterfly type (high performance), lugged style with tapped holes in a wafer body.

3.2 INSTALLATION INSTRUCTIONS

- A. Follow the manufacturer's recommended installation instructions concerning soldering, silver brazing, welding, threading, and installation of flanged valves in order to prevent damage to the valve and assure its maximum efficiency. Additional specific installation requirements are as follows:
 - 1. Thread pipe for threaded valves to standard length only, using new block dies.
 - 2. Put pipe compound on the pipe end, not into the valve threads. Securely screw pipe and valve together.
 - 3. Blow out or otherwise thoroughly clean pipe sections before they are installed.
 - 4. Close valve before installation.
 - 5. Secure and adjust valves for no leaks and for easy operation.

6. Install valves with stems horizontal or vertical above the pipe and square with building construction.
7. Install valves so piping does not place a stress or strain on the valve body.
8. Install extended-stem valves where insulation is indicated. Stems shall be extended such that the handle moves freely without contact with the insulation.
9. Install drain valves at low points of piping, at each mechanical equipment item, and elsewhere, where indicated.
10. Locate valves, cock, and hose bibbs to allow easy accessibility for operation, maintenance and repair.
11. Lugged butterfly valves with rubber-lined seats shall be installed with the disc(s) partially open. Bolts shall be torqued to the manufacturers recommendations.

3.3 SPECIAL OPERATORS FOR 1/4 TURN PRODUCTS

- A. Special slow closing operators shall be provided for quick closing valves to prevent the destructive fluid action of "water hammer" effects.

3.4 VALVE SCHEDULE

- A. Gate - All Sizes: HVAC and process piping systems. For applications where ball valves are not suitable.
- B. Check - All Sizes: HVAC and process piping systems.
- C. Ball - All Sizes: HVAC piping systems; for operation up to 200 psi at 500° F.
- D. Butterfly - 2 in. and Larger (Lined): HVAC piping systems; for operation up to 200 psi at 500° F.
- E. Butterfly - 2-1/2 in. and Larger (high performance): HVAC and process systems, as indicated on drawings.
- F. Drain: HVAC systems.

END OF SECTION

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Provide equipment, materials, labor and supervision necessary to install pipe hangers and supports.
- B. Pipe support systems shall secure pipes in place, prevent pipe vibration, provide vertical adjustment for maintaining required grades, and provide for expansion and contraction.
- C. Where supports are attached to concrete or other structural members, care shall be taken to prevent damage or weakening of the structural members.
- D. Where concrete inserts are to be used, it shall be this Contractor's responsibility to accurately locate and attach inserts to concrete forms.

1.2 REFERENCES

- A. American National Standards Institute, ANSI:
- B. ANSI B31.1: Power Piping
- C. Manufacturers Standardization Society of the Valve and Fittings Industry, MSS, 1815 North Fort Myer Drive, Arlington, VA 22209.
 - 1. MSS SP-58: Materials Standardization Society: Pipe Hangers and Supports-Materials, Design, and Manufacturer.
 - 2. MSS SP-69: Materials and Standardization Society: Pipe Hangers and Supports - Selection and Application.
 - 3. NFPA 13-Standard for the Installation of Sprinkler Systems.
 - 4. ASTM A123-Specification for Zinc Hot-Galvanized Coatings by the Hot Dip Process.
 - 5. ASTM A653 G90-Specification for Steel Sheet, Zinc on Iron and Steel.

1.3 SUBMITTALS

- A. Submit manufacturer's product data on all hangers and support devices. Product data to include, but not be limited to materials, finishes, approvals, load ratings, and dimensional information.

PART 2 PRODUCTS

2.1 HANGERS AND SUPPORTS

- A. Hangers and support devices shall be Anvil International Inc., Tolco, Fee and Mason, Michigan, B-Line or Engineer pre-approved equivalent. Figure numbers based on Anvil.

PART 3 EXECUTION

3.1 INSTALLATION - HORIZONTAL PIPE SUPPORTS

- A. Hanger rods for steel, wrought iron and brass pipe shall be installed in accordance with MSS SP-69 Tables 3 and 4 and the following schedule:

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1-1/4"	3/8"	7'-0"
1-1/2" and 2"	3/8"	9'-0"
2"	3/8"	10'-0"

Pipe Size	Rod Diameter	Maximum Spacing
2-1/2", 3" and 3-1/2"	1/2"	10'-0"
4" and 5"	5/8"	12'-0"
6"	3/4"	12'-0"
8"	7/8"	14'-0"
10" and 12"	7/8"	16'-0"
14" and 16"	1"	16'-0"
18"	1-1/8"	18'-0"
20" and 24"	1-1/4"	20'-0"

- B. Hanger rods for copper pipe and tube shall be installed in accordance with MSS-SP-69 Tables 3 and 4 and the following schedule:

Pipe Size	Rod Diameter	Maximum Spacing
1/2" and 3/4"	3/8"	5'-0"
1"	3/8"	6'-0"
1-1/4"	3/8"	7'-0"
1-1/2"	3/8"	8'-0"
2"	3/8"	8'-0"
2-1/2"	1/2"	9'-0"
3", 3-1/2" and 4"	1/2"	10'-0"
5"	1/2"	13'-0"
6"	5/8"	14'-0"
8"	3/4"	16'-0"

- C. Hanger rods and support spacing for Polypropylene (PP-R) pipe shall be in accordance with manufacturer's requirements.
- D. In addition to the above specified spacings, install additional hangers at change in pipe direction and at concentrated loads, large valves and strainers.
- E. Where more than one pipe is to be run parallel together, they may be supported on trapeze type hangers. Trapeze bar angles and hanger rods shall be of sufficient size to support the particular group of pipes. Trapeze hanger spacing shall be based on the smallest pipe on the rack. When hanging from light gauge metal trusses, coordinate pipe hanger spacing and hanger rod connection points with the truss manufacturer.
- F. For suspending hanger rods from brackets attached to walls, use welded steel brackets; Fig. 194 for loads up to 750 lbs; Fig. 195 for loads up to 1500 lbs; Fig 199 for loads up to 3000 lbs.
- G. Where pipes are to be racked along walls, use "Unistrut" pipe racks or 12 gauge steel strut channel, 1-5/8" x 1-5/8" minimum.
1. Mount pipes to strut channel with two-piece pipe straps to match outside diameter of pipe including insulation.
- H. Attach all pipe hangers from support rods using double locknuts tightened to prevent loosening.

3.2 INSTALLATION - VERTICAL PIPE SUPPORTS

- A. Support vertical steel, wrought iron, copper and brass pipe at every other floor line.
- B. Support vertical cast iron soil pipe and polypropylene pipe at every floor line.
- C. In addition to the above, support vertical pipes at base of riser with base fitting set on concrete or brick pier, or by hanger located on horizontal connection close to riser.
- D. Where pipe sleeves extend above floor, place pipe clamps at ceiling below and support clamp extensions from inserts or other approved attachment.

3.3 PIPE ATTACHMENTS

- A. For horizontal steel and wrought iron pipe, use carbon steel adjustable clevis hanger, Fig. 260. For floor support or support directly above steel beams, use pipe roll stand, Fig. 177.
- B. For horizontal copper pipe and tube, use copper-plated adjustable swivel ring, Fig. CT-69.
- C. When thermal expansion for horizontal pipe is in excess of ½" axially, use adjustable swivel pipe roll, Fig. 181, or pipe roll stand, Fig. 177.
- D. For horizontal cast iron soil pipe, use clevis hanger, Fig. 260.
- E. For vertical, steel, wrought iron and cast iron pipe, use extension pipe clamps, Fig. 261.
- F. For vertical copper pipe and tube, use copper-plated extension pipe clamp, Fig. CT-121.
- G. Provide rubber-lined or felt lined steel attachments for polypropylene systems.

3.4 INTERMEDIATE ATTACHMENTS

- A. Hanger rods: use carbon steel single or double end threaded, Figs. 140, 253 as required. Continuous threaded rod: Fig. 146 may be used wherever possible.
- B. Chain wire or perforated strap hangers will not be permitted. One pipe shall not be suspended from another pipe.

3.5 STRUCTURAL ATTACHMENTS

- A. For attaching steel or copper plated hanger rods to reinforced concrete, use galvanized malleable iron concrete inserts; Fig. 282 for loads up to 1140 lbs.
- B. For attaching steel hanger rods to structural steel beams, use malleable iron C-clamps; Fig. 92, Fig. 93 or Fig. 94 with retaining clip Fig. 89 or Fig. 89X for loads up to 500 lbs; Fig. 218 with extension piece for loads up to 1,365 lbs. For copper plated hanger rods, use copper plated malleable iron C-clamps; Fig. CT-138R for loads up to 180 lbs.
- C. For attaching steel hanger rods to wood structural members, use malleable iron ceiling flange; Fig. 153 for loads up to 1,270 lbs. For copper plated hanger rods, use copper plated malleable iron ceiling flange: Fig. CT-128R for loads up to 180 lbs.
- D. Vertical expansion shields or toggles shall not be used for suspending hanger rods, except with permission in cases where inserts have been omitted or cannot be used. If permitted, use expansion shields; for rod sizes up to ½", 320 lbs. max. load. For hanger rods larger than ½" use attachment plate, Fig. 52, with wedge anchors.
- E. Powder actuated anchoring methods shall not be used.

3.6 PIPE COVERING PROTECTION

- A. Hangers and supports for insulated piping shall not injure or pierce insulation. Provide insulation protection shields in conjunction with hanger or roll device. Use Fig. 160 and 165, Protection Saddles.

3.7 SUPPLEMENTAL STEEL

- A. Provide supplemental steel required to hang or support mechanical equipment or piping.

3.8 FLOOR MOUNTED PIPE SUPPORT SYSTEM

- A. Contractor shall engage a qualified professional engineer licensed in the State of Iowa to design the floor mounted pipe support system.
- B. Provide a submittal that will include analysis data and fabrication drawings signed and sealed by the qualified professional engineer responsible for their preparation.
- C. The support system shall consist of either steel or strut framing and shall be capable of supporting the piping (both horizontal and vertical piping) as shown on the drawings.
- D. The support system shall be designed to allow for access (in both the horizontal and vertical planes) to all new and existing mechanical and electrical equipment and all new and existing piping

END OF SECTION

SECTION 23 0548

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This specification pertains to the furnishing and installation of vibration isolation devices for HVAC piping and rotating or reciprocating mechanical equipment.
- B. This work shall include all material and labor required for installation of the resilient mounting and suspension systems, adjusting each mounting system, and measurement of isolator system performance when so requested by the Architect/Engineer. Specific mounting arrangements for each item of mechanical equipment shall be as described herein and as indicated by schedules and details on the drawings.

1.2 QUALIFICATIONS

- A. All rotating mechanical equipment shall be isolated from the structure by means of vibration isolators. The isolators and bases shall be as tabulated on the Vibration Isolation Schedule in this section. Any equipment not listed in this schedule shall be isolated with the isolator type and deflection shown in the 2007 ASHRAE HVAC Applications Handbook, Chapter 47, Table 48.
- B. Vibration isolators and bases shall be as manufactured by Kinetics Noise Control, Mason Industries, Amber Booth or Engineer pre-approved equivalent, and shall all be provided by the mechanical contractor from a single manufacturer to assure single responsibility for the performance of all isolation equipment. The isolator manufacturer's submittal shall include a tabulation of the design data with dimensions for both free and operating heights of the isolators.
- C. Engage manufacturer to provide technical supervision of installation of support isolation units produced, and of associated inertia bases.
- D. The Contractor and the vibration isolation manufacturer or his regularly designated and factory authorized representative shall perform the following tasks in addition to the supply and installation of isolation equipment:
 - 1. Obtain from the Architect/Engineer the approved manufacturer's name, model number, and other necessary identifying data for each item of mechanical equipment to be resiliently mounted. Coordinate resilient mounting systems with the exact equipment to be furnished in regard to physical size, isolator locations, weight, rotating speed, etc. Direct contact and cooperation between the vibration isolation device fabricator and the equipment manufacturer will be required.
 - 2. Select piping systems isolators for proper coordination with the physical arrangement of pipe lines and with the physical characteristics of the building.
 - 3. Provide on-the-job supervision as required during installation of resiliently mounted equipment and piping to assure that vibration isolators are installed in strict accordance with normally accepted practices for critical environments.
 - 4. Replace, at no extra cost to the Owner, isolators which do not produce the required deflection, are improperly loaded above or below their correct operating height, or which do not produce the required isolation.
 - 5. Cooperate with other contractors engaged in this project so that the installation of vibration isolation devices will proceed in a manner that is in the best interests of the Owner.
 - 6. Notify the Architect/Engineer of project conditions which affect vibration isolation system installation of performance and which are found to be different from conditions indicated by the drawings or described by the specifications. Should vibrations isolation system installation proceed without such notifications, remedial work required to achieve proper

isolator performance shall be accomplished by the contractor at no additional cost to the Owner.

7. Be alert for possible short-circuiting of vibration isolation systems by piping supports, electrical connections, temperature control connections, drain lines, building construction, etc., and notify the involved contractor as to these problems or potential problems. Where such situations cannot be easily resolved, notify the Architect/Engineer so that preventive or remedial action can take place on a timely basis. Remedial measures required shall be undertaken by the contractor responsible at no additional cost to the Owner.

- E. Vibration isolation products furnished as part of factory-fabricated equipment are specified as part of the equipment assembly in other Division 23 sections.
- F. Refer to other sections of these specifications for equipment foundations, hangers, sealants, gaskets and other work related to vibration isolation work.
- G. Where equipment manufacturer's recommendations differ from specified vibration isolation, submit to Architect for approval.
- H. Furnish templates to fabricators of equipment bases, foundations and other support systems, as needed for coordination of vibration isolation units with other work.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, detailed drawings, performance characteristic data and installation instructions for each type of unit required. Indicate equipment to be installed with isolator, tabulation of design data with dimensions for both free and operating heights of isolators, and load on each.

PART 2 PRODUCTS

2.1 GENERAL

- A. The vibration isolation systems described herein and identified by type number designations shall be applied to specific classifications of mechanical equipment as indicated in the Vibration Isolation Schedule.

2.2 TYPE 1 ISOLATORS (RUBBER & GLASS FIBER PADS AND HANGERS)

- A. Pre-compressed Molded Fiberglass Vibration Isolation Pads, individually coated with a flexible moisture impervious elastomeric membrane. Pads shall be fine (.00018 dia.) bonded annealed glass fibers which have been stabilized during manufacture by overloading the material ten times. Pads shall have a constant natural frequency over the operating load range, and the stiffness shall increase proportionately with load applied. Pads shall be no taller than the shortest horizontal dimension. Where the equipment base does not provide a uniform load surface, steel plates shall be bonded to the top of the pads. Alternately, Neoprene Mounts incorporating completely enclosed metal inserts to permit bolting the supported unit may be used.

2.3 TYPE 2 ISOLATORS (PAD AND HANGER TYPE)

- A. Molded isolators shall come in a range of 30 to 70 durometer and shall be designed for up to ½" deflection.
- B. Hangers shall be designed for a 20° to 35° misalignment.

2.4 TYPE 3 ISOLATORS (SPRINGS)

- A. Freestanding, Unhoused, Laterally Stable Steel Springs with leveling bolts and ¼-in. thick ribbed isolation pads. To assure stability, the spring shall have a lateral spring stiffness equal to the rated vertical stiffness, and shall be designed to provide 50% overload capacity. In capacities up to 5,000 lbs., springs shall be replaceable. In capacities over 5,000 lbs., springs shall be welded to the top and bottom load plate assemblies.

- B. Combination Spring and Rubber Hangers. The pre-compressed fiberglass shall be coated with a moisture impervious elastomeric membrane in series with springs, all encased in welded steel brackets. Springs shall be as specified for Type 3 isolators. Hangers shall be designed for 50% overload capacity, and shall accommodate rod misalignment over a 30° arc. Brackets shall be designed to carry 500% overload without failure.

2.5 TYPE 4 ISOLATORS

- A. Freestanding, Laterally Stable Spring Isolators with vertical limit stops to assure a constant operating height if the supported weight is removed, and to reduce movement due to wind loads. Limit stops shall be isolated from the housing to prevent short-circuiting.

2.6 TYPE A BASES

- A. No base required. Isolators may be attached directly to the supported equipment.

2.7 TYPE B BASES

- A. Structural Steel Base, designed and supplied by reducing the mounting height of equipment. To assure adequate stiffness, the height of the members shall be a minimum of 8% of the longest span between isolators, or at least 6 inches. Where thinner sections are necessary due to head room limitations, the section modulus of the members selected shall be equivalent to or exceed the section modulus of wide flange steel members whose thickness is 8% of the longest span between isolators.

2.8 TYPE C BASES

- A. Reinforced Concrete Inertia Base, the steel members of which are designed and supplied by the isolator manufacturer. The concrete shall be poured into a welded steel frame with pre-located equipment anchor bolts, ½-in. diameter reinforcing bars on nominal 8-in. centers each way, and recessed isolator mounting brackets to reduce the mounting height of the equipment, but yet remain within the confines of the base. The thickness of the base shall be a minimum of 8% of the longest span between isolators, at least 6 in., or as indicated on the drawings. Where inertia bases are used to mount pumps, the bases shall be wide enough to support piping elbows.

2.9 TYPE D BASES

- A. Roof Curb Isolators: Fabricated frame units sized to match roof curbs as shown, formed with isolation springs between extruded aluminum upper and lower sections, which are shaped and positioned to prevent metal-to-metal contact. Provide continuous airtight and waterproof seal between upper and lower extrusions. Include provisions for anchorage of frame unit to roof curb, and for anchorage of equipment to unit. Equivalent to Mason Type CMAB or RSC as required.

2.10 PIPING ISOLATION

- A. Piping over 1 in. diameter in mechanical equipment rooms, and piping three supports away from other mechanical equipment shall be isolated from the structure by means of vibration and noise isolators.
- B. Suspended piping shall be isolated with Type 2 Hangers.
- C. Floor mounted piping shall be isolated with Type 2 Isolators (spring mounts).
- D. Flexible members shall be incorporated in the piping adjacent to all equipment housing pipe connections (cooling tower, unit heaters, air handling units, chillers, etc.).

2.12 PUMP CONNECTORS

- A. For pump suction, provide model Metraflex Suction Diffuser Flex (SDF) with integral stationary turning vanes, 90° long radius elbow, 150# plate flanges, and integral concentric reducer where reduction is required. Use for both end suction and in-line hydronic pumps; end suction shall include

mount for support stanchion on exterior housing of elbow. Note: Use of the SDF replaces the requirement for typical suction diffusers in end suction applications.

- B. For pump discharge, provide Metraflex Vane Flex with 150# plate flanges, and integral concentric reducer where reduction is required. Use for both end suction and in-line hydronic pumps.

2.13 ELECTRICAL CONNECTIONS TO RESILIENTLY MOUNTED EQUIPMENT

- A. Electrical connections to equipment which is supported or suspended by vibration isolators shall be made with long lengths of flexible conduit or flexible armored cable. These flexible connections must be located so as to prevent rigid conduit connections between the resiliently mounted equipment and the building structure.

2.14 VIBRATION ISOLATION SCHEDULE

EQUIPMENT TYPE	ON GRADE		UP TO 20 FT FLR SPAN		20 TO 30FT FLR SPAN		20 TO 30FT FLR SPAN	
	TYPE B-I	MIN DFL	TYPE E B-I	MIN DFL	TYPE E B-I	MIN DFL	TYPE E B-I	MIN DFL
PUMPS, CLOSED COUPLED								
< OR = 7.5 HP	B-2	0.25	C-3	0.75	C-3	0.75	A-3	0.75
> OR = 10 HP	B-2	0.75	C-3	0.75	C-3	1.75	C-3	1.75

BASE TYPES:

A. NO BASE, ISOLATORS ATTACHED DIRECTLY TO EQUIPMENT

B. +PAD, RUBBER, OR GLASS FIBER

C. CONCRETE INERTIA BASE

D. CURB-MOUNTED BASE

ISOLATOR TYPES:

1. PAD, RUBBER, OR GLASS FIBER

2. RUBBER FLOOR ISOLATOR OR HANGER

3. SPRING FLOOR ISOLATOR OR HANGER

4. RESTRAINED SPRING ISOLATOR

5. THRUST RESTRAINT (SEE ASHRAE HANDBOOK)

PART 3 INSTALLATION

3.1 EXECUTION

- A. General: Except as otherwise indicated, comply with manufacturer's instructions for the installation and load application to vibration isolation materials and units. Adjust to ensure that units do not exceed rated operating deflections or bottom out under loading, and are not short-circuited by other contacts or bearing points. Remove space blocks and similar devices (if any) intended for temporary protection against overloading during installation.
- B. Anchor and attach units to substrate and equipment as required for secure operation and to prevent displacement by normal forces, and as indicated.
- C. Adjust leveling devices as required to distribute loading uniformly onto isolators. Shim units as required where leveling devices cannot be used to distribute loading properly.
- D. Flexible Pipe Connectors: Refer to other section of these Specifications for the installation of flexible pipe connectors.
- E. Install vibration isolators that are furnished with equipment.

END OF SECTION

SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Provide materials, equipment labor and supervision necessary to install piping identification products.
- B. Comply with ANSI A13.1 for lettering size, length or color field, colors, and installed viewing angles of identification devices.

1.2 QUALIFICATIONS

- A. Brady Corp., Industrial Safety Supply, Emedco, Seton, Brimar or Engineer pre-approved equivalent.

1.3 SCHEDULES

- A. Submit valve and damper schedule for each system, typewritten and reproduced on 8-1/2" x 11" bond paper. Tabulate valve and damper number, system, system abbreviation (as shown on tag), location of valve and damper (room or space), and variations for identification (if any). Mark valves and dampers that are intended for emergency shut-off and similar special uses, by special "flags", in margin of schedule.

1.4 SUBMITTALS

- A. Submit manufacturer's product data.

PART 2 PRODUCTS

2.1 PIPE MARKERS

- A. Provide manufacturer's standard preprinted, semi-rigid snap-on or self-sticking, color-coded pipe markers, complying with ANSI A13.1.
- B. Provide full-band pipe markers, extending 360° around pipe at each location or self-sticking pipe markers, fastened in the following method:
 - 1. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
 - 2. Secure to piping and install banding tape on both ends of each pipe label.
- C. Lettering shall be manufacturer's pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance.
- D. Print each pipe marker with arrows indicating direction of flow, integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic or on banding tape.

2.2 EQUIPMENT MARKERS

- A. Provide engraved signage nameplates and tags constructed of multi-layered acrylic that has been treated for outdoor use and can withstand temperatures up to 160° F. Nameplates shall have beveled edges with contrasting color core, letters, and border. Minimum size of nameplate shall be 3" high by 6" long. The minimum letter height shall be 3/4". Attachment shall be by double faced 2 mil permanent acrylic adhesive. For equipment that doesn't allow for direct attachment, furnish sheet metal backing to integrate with equipment such that signage can be read from 5 feet above the finished floor. Unless noted otherwise, signage shall be provided with black lettering, black border, and yellow core. All signage shall include up to 14 characters per line, minimum of 3 lines per tag. Furnish signage for equipment shown in Section 3:
 - 1. All pumps shall include the full name description for system served such as *"Primary Chilled Water Pump – 1."*

2. All air handling unit filter sections shall be labeled with the exact quantity of filters, size, and type of filter such as "14 – 24"x24"x2", 30% *Pleated Filters*."

- B. All equipment shall be named consistent with the plans and specifications as indicated on the schedules or as directed by the Owner.

2.3 BRASS VALVE TAGS

- A. Provide manufacturer's standard brass valve and damper tags with stamped black filled lettering, with piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 3/16" hole for fastener.
- B. Provide 1-1/2" round brass tags with black lettering. Seton 250 BL or equal.

2.4 VALVE TAG FASTENERS

- A. Manufacturer's standard solid brass chain or solid brass S-hooks of sizes required for proper attachment of tags to valves and dampers, and manufactured specifically for that purpose.

PART 3 EXECUTION

3.1 INSTALLATION OF MECHANICAL IDENTIFICATION

- A. Where identification is to be applied to surfaces that require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
- B. Install pipe markers on each system, and include arrows to show normal direction of flow.
- C. Locate pipe markers as follows: wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) above lay-in type ceilings and exterior non-concealed locations.
 1. Near each valve and control device.
 2. Near each branch, excluding short take-offs for fixtures, mark each pipe at branch where there could be question of flow pattern.
 3. Near locations where pipes pass through walls or floors/ceilings, (both sides) or center non-accessible enclosures.
 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. At each pipe passage to underground.
 7. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
 8. On piping above removable acoustical ceilings, maximum spacing of 20' along each piping run.
 9. Where self-sticking labels are used, the pipe or its covering surface shall be properly prepared. This consists of removal of loose dirt, oil and grease, loose paint or peeling insulation covering. This can be done with a brush and cloth; washing is not required. Use solvent for removal of oil or grease.
 10. Banding tape must be used on both ends of all self-sticking labels. The tape shall encircle the pipe completely and overlap itself so the banding tape can adhere to itself.
- D. Provide valve tags for all major valves 3/4" size or larger. Included are all main, zone and branch valves, valves in all equipment rooms, etc. All types of valves, ball, globe, butterfly, cocks, control,

regulating, relief, reducing, solenoid, etc. are to be identified except check valves. Do not identify end use point valves for plumbing fixtures, and similar rough-in connections.

- E. List each tagged valve and damper in schedule for each system showing function and location. Provide separate charts for mechanical divisions of work. Charts shall be installed on a conspicuous wall in the main mechanical equipment room. Provide unframed copies of valve and damper lists as part of closeout documents.

3.2 ADJUSTING AND CLEANING

- A. Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.
- B. Clean face of identification devices and glass frames of valve schedules.

3.3 PIPING AND EQUIPMENT IDENTIFICATION

- A. Piping systems that shall be identified by their controls (including directional arrows) on this project shall include, but are not necessarily limited to, the following:
 - 1. Geothermal glycol/water (supply and return)
- B. Equipment/Ductwork
 - 1. Air separator.
 - 2. Expansion tank.
 - 4. Pumps.
 - 5. Glycol Feeders.
 - 6. Provide name plates for all equipment scheduled on the drawings. Coordinate nameplate tag with Owner's sequencing system. If the Owner has no preference, the nameplates shall correspond with the equipment schedule.

END OF SECTION

SECTION 23 0593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

- A. The Contractor shall secure the services of an independent Balancing Contractor to accomplish the total system balance work associated with this project as defined by the Specification Section.
- B. This Contractor shall provide the support and coordination as outlined in this Specification Section and as required to complete the total system balance work as indicated.

1.2 QUALIFICATIONS

- A. The Balancing Contractor shall be certified by the AABC (American Association of Balancing Contractors). The Balancing Contractor shall provide labor, services, and test equipment required to test, adjust, and balance the specified systems. Personnel involved in the execution of the work under the Balancing Contract shall be experienced and trained in the total balancing of mechanical systems, as well as being regular employees of the Balancing Contractor.

1.3 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.
- C. Field Reports: Submit under provisions of Division 01.
- D. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- E. Prior to commencing work, submit report forms or outline indicating adjusting, balancing, and equipment data required.
- F. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.
- G. Provide final report(s) in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
- H. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.
- I. Test Reports: Indicate data on forms containing information indicated in Schedules.

1.4 SEQUENCING

- A. Sequence work to commence after completion of systems installation and schedule completion of balancing work before Substantial Completion of Project.
- B. Do not proceed with balancing work until systems scheduled for testing, adjusting, and balancing are clean and free from debris, dirt, and discarded building materials.

PART 2

2.1 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 OTHER CONTRACTOR RESPONSIBILITIES

- A. The Mechanical and Plumbing Contractors shall cooperate with the balancing agency by:
 - 1. Including balancing dampers as required by the Drawings and Specifications.
 - 2. Putting complete system into operation during duration of balancing period.
 - 3. Providing up-to-date set of Drawings and advising immediately of changes made to the system during construction.
 - 4. Providing labor and equipment and cost of performing corrections such as dampers, belts, and pulley changes, etc. as required without undue delay.
 - 5. Providing complete submittal information for mechanical equipment complete with pertinent engineering information.

3.2 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions.
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Hydronic systems are flushed, filled, and vented.
 - 5. Pumps are rotating correctly.
 - 6. Proper strainer baskets are clean and in place.
 - 7. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.
- C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

3.4 ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostat to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

- F. Check and adjust systems approximately six months after final acceptance and submit report.

3.5 WATER SYSTEM PROCEDURES

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.
- G. Three way valves shall be tested and balanced for flow capacities at full coil flow and full bypass flow, as indicated on the drawings or at a maximum coil flow, whichever is less.

3.6 SCHEDULES

A. Equipment Requiring Testing, Adjusting, and Balancing

- 1. HVAC Pumps
- 2. Geothermal Circuits

B. REPORT FORMS

- 1. Title Page:
 - a. Name of Testing, Adjusting, and Balancing Agency
 - b. Address of Testing, Adjusting, and Balancing Agency
 - c. Telephone number of Testing, Adjusting, and Balancing Agency
 - d. Project name
 - e. Project location
 - f. Project Architect
 - g. Project Engineer
 - h. Project Contractor
 - i. Project altitude
 - j. Report date
- 2. Summary Comments:
 - a. Design versus final performance
 - b. Notable characteristics of system
 - c. Description of systems operation sequence
 - d. Summary of outdoor and exhaust flows to indicate amount of building pressurization

- e. Nomenclature used throughout report
 - f. Test conditions
- 3. Instrument List:
 - a. Instrument
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Range
 - f. Calibration date
- 4. Electric Motors:
 - a. Manufacturer
 - b. Model/Frame
 - c. HP/BHP.
 - d. Phase, voltage, amperage; nameplate, actual, no load
 - e. RPM
 - f. Service factor
 - g. Starter size, rating, heater elements
 - h. Sheave Make/Size/Bore
- 5. Pump Data:
 - a. Identification/number
 - b. Manufacturer
 - c. Size/model
 - d. Impeller
 - e. Service
 - f. Design flow rate, pressure drop, BHP
 - g. Actual flow rate, pressure drop, BHP
 - h. Discharge pressure
 - i. Suction pressure
 - j. Total operating head pressure
 - k. Shut off, discharge and suction pressures
 - l. Shut off, total head pressure
- 6. Flow Measuring Station:
 - a. Identification/number
 - b. Location

- c. Size
- d. Manufacturer
- e. Model number
- f. Serial number
- g. Design flow rate
- h. Design pressure drop
- i. Actual/final pressure drop
- j. Actual/final flow rate
- k. Station calibrated setting

END OF SECTION

SECTION 23 0700
HVAC INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Provide equipment, materials, labor and supervision necessary to install insulation to hot and cold surfaces of piping, tanks, ductwork, fittings and other surfaces.
- B. Insulation shall include insulating materials, jackets, adhesive, mastic coatings, tie wire and other materials as required to complete the insulating work.

1.2 CODES AND STANDARDS

- A. Insulating materials, jackets and mastics shall meet flame spread, fuel contribution and smoke developed ratings in accordance with NFPA-90A. Flame spread rating in accordance with NFPA 255, ASTM E-84 or UL 723 of not more than 25; smoke developed rating of not more than 50, unless otherwise noted in this section.
- B. Insulation that has been treated with a flame-retardant additive to meet the flame spread and smoke developed ratings shown above is not permitted.
- C. Insulation materials shall be noncorrosive to the materials they are applied to, including stress corrosion cracking of stainless steel, and shall not breed or promote fungus and bacteria.
- D. Insulation shall meet or exceed all requirements of the 2012 International Energy Conservation Code.

1.3 QUALIFICATION

- A. Insulating materials by Owens-Corning, Pittsburgh-Corning, Knauf, Johns Manville, or Engineer pre-approved equivalent.
- B. Mastics and adhesives as recommended by insulation manufacturer.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, flame spread and smoke development rating, k-value, density, temperature limitations, sound absorption coefficients, thickness, and furnished accessories for each mechanical system requiring insulation.

PART 2 PRODUCTS

2.1 PRODUCTS

- A. Description:
 - 1. Type A: Preformed, sectional, heavy density fiberglass insulation, suitable for operating temperatures from -20°F to $+850^{\circ}\text{F}$. Equipped with factory-applied, all-service vapor barrier jacket constructed of white Kraft paper bonded to aluminum foil reinforced with fiberglass yarn, with pressure-sensitive, self-sealing longitudinal laps and butt strips. thermal conductivity of 0.23 BTU-in/hr-ft²-°F @ 75° F mean temperature. Water vapor permeance of 0.02 perms. Johns Manville "Micro-Lok HP or approved equivalent.

Mean Temperature Rating (F)	Conductivity BTU in/(hr sqft F)
250	0.32 - 0.34
200	0.29 - 0.32
150	0.27 - 0.30
125	0.25 - 0.29

100	0.21 - 0.28
75	0.21 - 0.28

2. Type B: Flexible, elastomeric pipe and sheet insulation with closed-cell structure. Shall comply with ASTM C534, Type I, Grade 1 for tubular materials and ASTM C534 Type II, Grade 1 for sheet materials. Suitable for operating temperatures from -40° F to 220° F. Outdoor applications, and where otherwise noted, shall receive a weather-resistant, protective, latex enamel finish. Thermal conductivity of 0.28 BTU-in/hr-ft²-°F @ 75° F mean temperature. Water vapor permeance of 0.08 perms. Insulation shall be equivalent to Armacell AP Armaflex; adhesive equivalent to Armacell Armaflex 520 or Armaflex 520 BLV Low-VOC Contact Adhesive; finish equivalent to Armacell Armaflex WB finish.

2.2 INSULATION JACKETS

- A. 20-mil high impact PVC secured with spray contact adhesive. All PVC jacketing shall meet the 25/50 SDR. Manville "Zeston 2000" or equivalent.
- B. 6-oz/sq yd UL listed cotton canvas fabric secured with Childers CP50 lagging adhesive.
- C. Fitting and valve jackets shall be pre-molded PVC with joints and seams sealed with a spray contact adhesive or vapor barrier mastic. Pre-molded jackets shall be Manville "Zeston 2000" or approved equivalent.
- D. At wall penetrations and on exterior pipes and ducts, provide an additional jacket of 0.020 inch thick smooth finish aluminum.
 1. Metal jacket shall have factory applied moisture barrier.
 2. Banding shall be 3/4" x 0.020" stainless steel, 12" maximum spacing.
 3. Fitting and valve covers to be preformed of same material as adjacent metal jacket.
- E. Where PVC or metal jackets are used, delete the factory applied ASJ on pipe and equipment operating above 75° F.
- F. PVC jackets shall be used in the following areas and systems:
 1. Whenever piping is routed exposed through occupied spaces.
 2. Pre-molded PVC at all fittings and valve jackets.
 3. PVC jackets shall be eliminated for piping that is to be painted.
- G. Insulated Fittings:
 1. Use "Valve Wrap" insulated wraps at all fittings and valves. Provide reusable insulated wraps for unions, strainers, auto flow valves, circuit setters, check valves and components integral to heat pump hose kits.
 2. Provide with insulation values (i.e. thickness) consistent with insulation specified for associated piping service. Valve wrap shall be provided in sufficient length to completely conceal all integral components including 2" minimum overlap on pipe at each end.
 3. Wraps shall be No Sweat reusable wraps (www.valvewraps.com) or approved equivalent.
 4. Wraps shall be sized and installed per manufacturer's recommendations.
 5. Ensure locations of all wrapped components are clearly identified on mechanical contractors' record drawings.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use only experienced applicators regularly engaged in the trade. Rough work will be rejected. Application details shall be in accordance with the insulation materials supplier's recommendations, except where a higher standard is specified.
- B. Install materials after systems have been tested and approved. Material such as rust, scale, dirt and moisture shall be removed from surfaces to be insulated.
- C. Insulation shall be kept clean and dry at all times.
- D. Where pipes and ducts pass through fire rated walls, floors and partitions, a fire seal shall be provided.
- E. When flexible cellular insulation is used, it shall be installed with seams and joints sealed with contact adhesive.
 - 1. Wherever possible, the insulation shall be placed over the pipe before it is installed. Seal the butt joints with Armacell Armaflex 520, or Armaflex 520 BLV Low-VOC Contact Adhesive or equal.
 - 2. Where the insulation cannot be slipped on, cut the insulation longitudinally and apply it to the piping. Seal longitudinal seam and butt joints with Armacell Armaflex 520 adhesive, or Armaflex 520 BLV Low-VOC Contact Adhesive or equal. In all cases, the insulation, equal to Armacell AP, protected with half-round PVC sleeves the length of three times the nominal pipe size, minimum length to be 8 inches.

3.2 PIPE INSULATION INSTALLATION

- A. Insulate fittings, valves, unions, flanges, strainers, flexible connections and expansion joints with pre-molded or mitered segments of same insulating material as for adjacent pipe covering.
- B. Pipe insulation shall continue through sleeves and hangers with vapor barrier and/or jacket.
- C. Insert to be between support shield and piping but under the finish jacket. Provide an insert at hangers not less than 6 inches long, of same thickness and contour as adjoining insulation, to prevent insulation from sagging at support points. Inserts shall be heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used.
- D. Neatly finish insulation at supports, protrusions and interruptions.
 - 1. On hot systems where fittings are to be left exposed, insulation ends shall be beveled away from bolts for easy access.
 - 2. On cold systems, valve stems shall be sealed with caulking which allows free movement of the stem, but provides a seal against moisture incursion.
- E. For outdoor pipe insulation, increase pipe insulation thickness by ½" from thickness listed in schedule and provide metal jacket.
- F. Wherever piping penetrates a floor or is exposed in a finished area such as kitchens, furnish a floor pipe escutcheon and/or PVC (white) jacket to protect insulation and allow for a smooth finish for cleaning.

3.3 EQUIPMENT INSULATION

- A. Do not insulate factory-insulated equipment.
- B. Apply insulation as close as possible to equipment by grooving, scoring and beveling insulation, if necessary. Secure insulation to equipment with studs, pins, clips, adhesive, wires or bands.

- C. Fill joints, cracks, seams and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.
- D. Cover insulation with metal mesh and finish with ¼" coat of insulating cement applied in two 1/8" layers, if non-faced insulation is used.
- E. Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around such.
- F. When equipment with insulation requires periodical opening for maintenance, repair or cleaning such as at manway covers or strainer plugs, install insulation in such a manner that it can be easily removed and replaced without damage. Removable insulation shall have a vapor-proof cover fabricated so as to allow it to be resealed to the equipment vapor barrier.
- G. Joints shall be sealed with 2" wide vapor barrier tape or strips to match insulation jacket, using a fire-resistive adhesive.

3.4 PIPE INSULATION SCHEDULE (BASED ON 2012 IECC)

SERVICE	TEMP (°F)	TYPE	NOMINAL PIPE SIZE (INCHES)				
			<1	1 TO <1-1/2	1-1/2 TO <4	4 TO <8	8+
Geothermal Loop Piping		A	1"	1"	1-1/2"	1-1/2"	1-1/2"

3.5 EQUIPMENT INSULATION SCHEDULE

SERVICE	TYPE	THICKNESS
Pump Bodies	Z	
Air Separators < 28" Diameter	B	1-1/2"
Air Separators > or = 28" Diameter	G	1-1/2"
Pipe Anchors / Guides	B	3/4"

END OF SECTION

SECTION 23 0900
INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

- A. Provide materials, labor, and supervision necessary to furnish and install a web-based Direct Digital Control (DDC) system. The DDC system herein specified shall be fully integrated and installed as a complete package by the Direct Digital Control Manufacturer. The system shall include all computer software, operator input/output devices, automation sensors and controls, wiring, piping, installation, supervision and labor, calibration, adjustments, testing and commissioning necessary for a complete and fully operational system.
- B. General Description:
 - 1. The DDC control system shall include:
 - a. All points described and/or indicated in this project and shall be capable of point expansion in the future; future expansion shall not be limited to less than 1000 additional points of control.
 - 2. The DDC system components shall be BACnet BTL certified, utilizing an operator workstation at the LAN (local IP at building) level; this LAN shall be sufficient to operate this building's systems as stand alone.
 - 3. All components on IP subnets (field busses) shall support MS/TP architecture, with full functionality and communication both with and without the building controller.
 - 4. Each controller shall be capable of full and complete standalone operation of respective unit.
- C. Project Specific Requirements:
 - 1. All hardware, equipment and material shall be completely installed two (2) weeks prior to Substantial Completion, to allow immediate start by the temperature controls contractor (TCC) as identified directly below.

1.2 QUALIFICATIONS

- A. The control system shall meet specifications and qualifications as described. The controls contractor shall have experience with geothermal ground source system and other systems as required by the sequence of operations.
- B. The temperature controls system on this project shall be the following:
 - 1. Baker Group
 - 2. Basepoint Building Automations (formerly CI3)
 - 3. Johnson Controls Metasys
 - 4. Woodman Controls
 - 5. Engineer pre-approved equivalent
- C. All work is to be installed by a qualified person skilled in the installation of electronic automatic control systems. The control contractor is responsible for the proper installation of the control system.
 - 1. The installer shall have a service office within 50 miles of the project site and provide 24-hour response in the event of a customer call.

- D. The contractor may elect to subcontract the installation of the electronic control system but will be responsible in total as outlined above.
- E. All products used in this installation shall be new, currently under manufacture, and shall be applied in similar installations for a minimum of 2 years. This installation shall not be used as a test site for any new products unless explicitly approved by the Owner's representative in writing prior to bid date. Spare parts shall be available for at least 10 years after completion of this contract.

1.3 WORK BY OTHERS

- A. The following incidental work shall be furnished by the Mechanical Contractor under the supervision of this Contractor.
 - 1. Install automatic valves and separable wells
 - 2. Furnish and install all necessary valves, pressure taps, flow meters, water, drain and overflow connections and piping.
 - 3. Furnish and install all necessary piping connections required for flow devices, valve position indicators, etc.
 - 4. Install geothermal water flow measuring devices.
- B. The TCC shall provide a technical representative to accompany the testing and balancing contractor whenever the latter is onsite, to ensure availability of complete controls manipulation is provided to the TAB contractor. Review schedule of contractor-access to the building during in-session periods for controls commissioning (including testing and calibration) and testing and balancing of all systems with Construction Manager (CM).

1.4 DESCRIPTION

- A. Direct Digital Control (DDC) technology shall be used to provide the functions necessary for control of mechanical systems on this project. Specifically, BACnet MS/TP shall be fully implemented within the DDC system installed. All references to BACnet, BACnet Testing Laboratory (BTL), etc. shall be as defined by ASHRAE Standard 135-2004.
- B. The control system shall accommodate simultaneous multiple user operation. Access to the control system data should be limited only by operator password. Multiple users shall have access to all valid system data. An operator shall be able to log onto the control system and have access to all data appropriate to the assigned level of password security.
- C. The control system shall be designed such that each mechanical system will be able to operate under stand-alone control. As such, in the event of a network communication failure, or the loss of any other controller, the control system shall continue to independently operate under control.
- D. Communication between the control panels and all workstations shall be over a high-speed network. All nodes on this network shall be peers. The operator shall not have to know the panel identifier or location to view or control an object. Application Specific Controllers shall be constantly scanned by the network controllers to update point information and alarm information.
- E. The documentation is schematic in nature. The Contractor shall provide hardware and software necessary to implement the functions and sequences shown.
- F. Global commands. The Owner shall have full command of all sensor deadbands, to allow discretionary over-ride from the District's central operator workstation.
- G. Each mechanical unit identified to be controlled through the BAS shall be provided a dedicated controller, to ensure all points associated with that unit reside under that controllers' specific identifier. The following exceptions apply: shared controllers may be acceptable if serving

similar, non-intelligent, non-programmable equipment (exhaust fans) and only when the indicated equipment points can completely reside together. The intent is to prevent scattering of points, ungrouped and/or separated between unrelated controllers.

1.5 SUBMITTALS

- A. Contractor shall provide shop drawings and manufacturers' standard specification data sheets on all hardware and software to be provided. No work may begin on any segment of this project until submittals have been reviewed by the Engineer and Owner for conformity with the plan and specifications. All shop drawings shall be done on AutoCAD no older than version 2006, and provided to the Engineer for review and to the Owner on electronic media.
- B. Quantities of items submitted shall be reviewed by the Engineer and Owner. Such review shall not relieve the contractor from furnishing quantities required for completion.
- C. Provide the Engineer and Owner, any additional information or data which is deemed necessary to determine compliance with these specifications or which is deemed valuable in documenting the system to be installed.
- D. Submit the following within 30 days of contract award:
 - 1. A complete bill of materials of equipment to be used indicating quantity, manufacturer and model number.
 - 2. A schedule of all control valves including the valve size, model number (including pattern and connections), flow, CV, pressure rating, and location.
 - 3. Provide manufacturers cut sheets for major system components. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is being submitted to cover. Include:
 - a. Building Controllers, Custom Application Controllers, and Application Specific Controllers
 - b. Auxiliary Control Devices
 - c. Proposed control system riser diagram showing system configuration, device locations, addresses, and cabling
 - d. Detailed termination drawings showing all required field and factory terminations. Terminal numbers shall be clearly labeled.
 - e. Points list showing all system objects, and the proposed English language object names for Owner review and revision. Each piece of equipment shall be referenced by using respective Tag or Plan Mark consistent with equipment schedules.
 - f. Sequence of operations for each system under control. This sequence shall be specific for the use of the Control System being provided for this project.
 - g. Provide a BACnet Product Implementation Conformance Statement (PICS) for each BACnet device type in the submittal.
 - h. Color prints of proposed graphics with a list of points for display.
- E. Project Record Documents: Upon completion of installation submit five (5) copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and include:

1. Project Record Drawings - These shall be as-built versions of the submittal shop drawings. One set of magnetic media including CAD.DWG or.DXF drawing files shall also be provided.
 - a. Identify on drawings locations of all remote and/or concealed equipment.
2. Operating and Maintenance (O & M) Manual - These shall be as-built versions of the submittal product data. In addition to that required for the submittals, the O & M manual shall include:
 - a. Names, address and 24-hour telephone numbers of Contractors installing equipment, and the control systems and service representative of each.
 - b. Operators Manual with procedures of operating the control systems including logging on/off, alarm handling, producing point reports, trending data, overriding computer control, and changing set points and other variables.
 - c. Programming Manual with a description of the programming language including syntax, statement descriptions including algorithms and calculations used, point database creation and modification, program creation and modification, and use of the editor.
 - d. Engineering, Installation and Maintenance Manual(s) that explains how to design and install new points, panels, and other hardware; preventative maintenance and calibration procedures; how to debug hardware problems; and how to repair or replace hardware.
 - e. A listing and documentation of all custom software created using the programming language including the point database. One set of magnetic media containing files of the software and database shall also be provided
 - f. A list of recommended spare parts with part numbers and supplier.
 - g. Complete original issue documentation, installation and maintenance information for all third party hardware provided including computer equipment and sensors.
 - h. Complete original issue DVD for all software provided including operating systems, programming language, operator workstation software, and graphics software. DVD's shall be 4.7 GB minimum, read-only to prevent overwrite. Each disk and case shall be identified as to project/phase and date; any changes to software shall be followed with backup using additional DVD's.
 - i. Licenses, Guarantee, and Warrantee documents for all equipment and systems.
 - j. Recommended preventive maintenance procedures for all system components including a schedule of tasks (inspection, cleaning, calibration, etc.), time between tasks, and task descriptions.
- F. Training Manuals: The Contractor shall provide a course outline and training manuals for all training classes at least six weeks prior to the first class. The Owner reserves the right to modify any or all of the training course outline and training materials. Review and approval by Owner and Engineer and shall be completed at least 3 weeks prior to first class.

1.6 CODES & STANDARDS

- A. Input/output devices, specified or future, associated with the DDC control system shall be ASCII (American Standard Code for Information Interchange) coded with standard EIA (Electronic Industries Association) interface hardware.

- B. Wiring performed by the DDC Contractor shall be installed in accordance with all applicable local, state, and national codes.
- C. Instrumentation hardware shall be supplied to directly interface with Instrument Society of America (ISA) Standards.
- D. BACnet implies BACnet protocol as defined by ASHRAE standard 135-2016.
- E. Meet requirements of all applicable standards and codes, except when more detailed or stringent requirements are indicated by the Contract Documents, including requirements of this Section.
 - 1. Underwriters Laboratories: Products shall be UL-916-PAZX listed.
 - 2. National Electrical Code - NFPA 70.
 - 3. Federal Communications Commission - Part J.

1.7 WARRANTY

- A. Labor & materials for control system specified shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. Control System failures during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during customary business hours.
- B. At the end of the final start-up/testing, if equipment and systems are operating satisfactorily to the Owner and Engineer, the Owner shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this specification. The date of Owner's acceptance shall be the start of warranty.
- C. Operator workstation software, project specific software, graphics, database, and firmware updates shall be provided to the Owner at no charge during the warranty period. Written authorization by Owner must, however, be granted prior to the installation of such changes.

1.8 OWNERSHIP OF PROPRIETARY MATERIAL

- A. All project developed hardware, software and documentation shall become the property of the Owner. These include but are not limited to: Project images, Record drawings, Project database, project-specific controller configuration tool (JCI-CCT) or application programming code (CI³-APT) and all project-related documentation.

1.9 SYSTEM PERFORMANCE

- A. Performance Standards. The system shall conform to the following:
 - 1. Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be 30 seconds. Analog objects shall start to adjust within 30 seconds.
 - 2. Object Scan. All changes of state and change of analog values shall be transmitted over the high-speed network such that any data used or displayed at a controller or workstation will be current, within the prior 60 seconds.
 - 3. Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 45 seconds.
 - 4. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.

5. Performance. Programmable Controllers shall be able to execute DDC PID control loops at a selectable frequency from at least once every 5 seconds. The controller shall scan and update the process value and output generated by this calculation at this same frequency.
6. Multiple Alarm Annunciation. All workstations on the network shall receive alarms within 5 seconds of each other.
7. Reporting Accuracy. Table 1 lists minimum acceptable reporting accuracies for all values reported by the specified system.

a. TABLE I -- REPORTING ACCURACY

<u>Measured Variable</u>	<u>Reported Accuracy U.N.O</u>
Space temperature $\pm 1^{\circ}\text{F}$	
Ducted air	$\pm 2^{\circ}\text{F}$
Outside air	$\pm 2^{\circ}\text{F}$
Water temperature $\pm 1^{\circ}\text{F}$	
Delta-T	$\pm 0.25^{\circ}\text{F}$
Relative humidity	$\pm 5\% \text{ RH}$
Water flow	$\pm 5\% \text{ of full scale}$
Air flow (terminal)	$\pm 10\% \text{ of reading *Note 1}$
Air flow (measuring stations) $\pm 5\% \text{ of reading}$	
Air pressure (ducts) $\pm 0.1" \text{ W.G.}$	
Water pressure	$\pm 2\% \text{ of full scale *Note 2}$
Electrical power	$5\% \text{ of reading}$
Carbon dioxide (co2) $\pm 20 \text{ PPM}$	

Note 1: 10%-100% of scale

Note 2: for both absolute and differential pressure

PART 2 PRODUCTS

2.1 OPERATOR INTERFACE

- A. Furnish a full graphics system to interface with the Owner's existing PC "operator workstation" via web IP address. The system shall include all software and hardware necessary to provide full graphics at the location of the existing operator workstation.

2.2 SUPERVISED TRAINING

- A. Provide a total of 16 hours of supervised training for up to 4 of the Owners representatives simultaneously to include system operation, programming, report generation, and construction of graphics. Training shall take place at the project site during the normal work hours of 8am to 5pm weekdays. Multiple training sessions (4 sessions minimum) shall be scheduled at the Owner's discretion, in no larger than 4-hour blocks, to be completed within one calendar year, and shall include:
 1. Explanation of drawings, operations and maintenance manuals.
 2. Walk-through of the job to locate control components.
 3. Operator workstation and peripherals.

4. DDC custom application controllers, ASC, TEC, SAC operation and function.
 5. Operator control functions including graphic generation and field panel programming.
 6. Explanation of adjustment, calibration and replacement procedures.
- B. Provide operator orientation to the overall operational program, equipment functions (both individually and as part of the total integrated system), commands, advisories, and appropriate operator intervention required in responding to the systems operation. An Owner's manual prepared for this project by the DDC manufacturer shall be used in addition to the instruction. Three copies of the Owner's manual shall be provided.
- C. The technical training will also include adequate instruction and documentation to enable maintenance staff to trouble shoot, repair, and maintain entire system and recreate all programming without factory assistance.
- D. The technical training will also include adequate instruction and documentation to allow expansion by the maintenance staff of the system in the future to interface with existing pneumatic, electric, and electronic control systems. This would include activities associated with hardware and software.
- E. The owner reserves the right to have credited any instructional time (i.e. training, demonstration, orientation, testing, etc.) identified in this Section, deemed by the owner to be unnecessary or not completed. Unused time shall be credited back to the owner to the nearest quarter hour and shall be credited as future technical field service time.

2.3 COMMISSIONING OF SYSTEM

- A. The Temperature Control Contractor shall verify that each analog and binary device and operator responds correctly to the signal given at the control panel by physically changing each parameter and witnessing the correct corresponding reaction. The results of this testing shall be logged in a written report and submitted to the Owner and Engineer prior to final payment.
- B. The Owner's representative shall witness the commissioning of the system.

2.4 SYSTEM SOFTWARE

- A. Operating System. Furnish a commercially available, concurrent multi-tasking operating system. The operating system shall also support the use of other common software applications that operate under Microsoft Windows. Examples include Lotus 123, Microsoft Excel, Word Perfect, and Paradox. Acceptable operating systems are Windows NT, Windows 95 (or later version), Unix, and OS/2.

2.5 SYSTEM APPLICATIONS

- A. Each workstation shall provide operator interface and off-line storage of system information. Provide the following applications at each workstation.
1. Automatic System Database Save and Restore. Each workstation shall store on the hard disk a copy of the current database of each building controller. This database shall be updated whenever a change is made in any panel in the system. The storage of this data shall be automatic and not require operator intervention. In the event of a database loss in a building management panel, the first workstation to detect the loss shall automatically restore the database for that panel.
 2. Manual Database Save and Restore. A system operator with the proper password clearance shall be able to archive the database from any system panel and store on magnetic media. The operator shall also be able to clear a panel database and manually initiate a download of a specified database to any panel in the system.

3. System Configuration. The workstation software shall provide a graphical method of configuring the system. The user with proper security shall be able to add new devices, assign modems to devices, and obtain a visual riser diagram of the system. This shall allow for future system changes or additions.
4. On-Line Help. Provide a context sensitive, on line help system to assist the operator in operation and editing of the system. On line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext.
5. Security. Each operator shall be required to log on to the system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system supervisor shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operator's access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto logoff time shall be set per operator password. All system security data shall be stored in an encrypted format.
6. Alarm Processing. Any object in the system shall be configurable to alarm in and out of normal state. The operator shall be able to configure the alarm limits, warning limits, states, and reactions for each object in the system.
 - a. Alarm Reactions. The operator shall be able to determine what actions, if any, are to be taken, by object (or point), during an alarm. Actions shall include logging, printing, starting programs, displaying messages, dialing out to remote stations, paging, providing audible annunciation or displaying specific system graphics. Each of these actions shall be configurable by workstation and time of day. An object in alarm that has not been acknowledged within an operator specified time period shall be re-routed to an alternate operator specified alarm receipt device.
 - b. Binary Alarms. Each binary object shall be set to alarm based on the operator specified state. Provide the capability to disable alarming when the associated equipment is turned off or is being serviced.
 - c. Analog Alarms. Each analog object shall have both high and low alarm limits and warning limits. Alarming must be able to be automatically and manually disabled.
7. Trend Logs. The operator shall be able to define a custom trend log for any data in the system. This definition shall include interval, start-time, and stop-time. Trend intervals of change of state or 1, 5, and 15 minutes shall be selectable. Each trend shall be stored for 1 month minimum. The system operator with proper password shall be able to determine how many samples are stored in each trend. Trend data shall be sampled and stored on the Building Controller panel and be archived on the hard disk. Trend data shall be able to be viewed and printed from the operator interface software. They shall also be storable in a tab delimited ASCII format for use by other industry standard word processing and spreadsheet packages.
 - a. The initial trend log setup shall give the operator a trend log the input and output devices associated with the new geothermal pumps. This would include, but not be limited to, pump status operation, supply and return temperatures, 3-way bypass valve position.
8. Alarm and Event Log. The operator shall be able to view all logged system alarms and events from any location in the system. Events shall be listed chronologically. An operator with the proper security level may acknowledge and clear alarms. All that have not been cleared by the operator shall be archived to the hard disk on the workstation.

9. Object and Property Status and Control. Provide a method for the operator with proper password protection to view, and edit if applicable, the status of any object and property in the system. These statuses shall be available by menu, on graphics, or through custom programs.
 10. Clock Synchronization. The real time clocks in all building control panels and workstations shall be synchronized on command of an operator. The system shall also be able to automatically synchronize all system clocks, daily from any operator designated device in the system. The system shall automatically adjust for daylight savings and standard time if applicable.
 11. Reports and Logs. Provide a reporting package that allows the operator to select, modify, or create reports. Each report shall be definable as to data content, format, interval, and date. Report data shall be archived on the hard disk for historical reporting. Provide the ability for the operator to obtain real time logs of designated lists of objects. Reports and logs shall be stored on the PC hard disk in a format that is readily accessible by other standard software applications including spreadsheets and word processing. Reports and logs shall be readily printed to the system printer.
 - a. Custom Reports: Provide the capability for the operator to easily define any system data into a daily, weekly, monthly, or annual report. These reports shall be time and date stamped and shall contain a report title and the name of the facility.
- B. Workstation Applications Editors. Each PC workstation shall support full screen editing of all system applications. Provide editors for each application at the PC workstation. The applications shall be downloaded and executed at the appropriate controller panels.
1. Programming. The language shall be English language oriented and be based on the syntax of programming languages such as BASIC. It shall allow for free form or fill-in-the-blank programming: Using simple English, all text fields associated with each specific element of data shall be programmed to provide the maximum amount of information to the operator.
 2. Controller. Provide a full screen editor for each type controller and application that shall allow the operator with proper password to view and change the configuration, name, control parameters, and system set-points.
 3. Scheduling. An editor for the scheduling application shall be provided at each workstation. Provide a monthly calendar for each schedule. Exception schedules and holidays shall be shown clearly on the calendar. Provide a method for allowing several related objects to follow a schedule. The advance and delay time for each object shall be adjustable from this master schedule.
 - a. An operator with proper password level shall be able to modify the schedule. Schedules shall be able to be easily copied between objects and/or dates.
 - b. Occupied/Unoccupied schedules shall be individually adjustable for each terminal unit. The user shall be able to easily change the schedule of rooms, etc. An occupied space shall automatically start the unit in normal start up mode.
 4. Equipment Coordination. Provide a full screen editor that allows equipment to be grouped for proper operation as specified in the sequence of operations.
 5. Custom Application Programming. Provide the tools to create, modify, and debug custom application programming. The operator shall be able to create, edit, and download custom programs at the same time that all other system applications are operating. The system shall be fully operable while custom routines are edited,

compiled, and downloaded. The programming language shall have the following features:

- a. A full screen character editor/programming environment shall be provided. The editor shall be cursor/mouse-driven and allow the user to insert, add, modify, and delete code from the custom programming. It shall also incorporate word processing features such as cut/paste and find/replace.
- b. The programming language shall allow independently executing program modules to be developed. Each module shall be able to independently enable and disable other modules.
- c. The editor/programming environment shall have a debugging/simulation capability that allows the user to step through the program and to observe any intermediate values and or results. The debugger shall also provide error messages for syntax and execution errors.
- d. The programming language shall support conditional statements (IF/THEN/ELSE/ELSE-IF) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
- e. The programming language shall support floating point arithmetic using the following operators: +, -, /, x, square root, and xy. The following mathematical functions shall also be provided: natural log, log, absolute value, and minimum/maximum value from a list of values.
- f. The programming language shall have pre-defined variables that represent clock time, day of the week, and date. Variables that provide interval timing shall also be available. The language shall allow for computations using these values.
- g. The programming language shall have ability to pre-defined variables representing the status and results of the System Software, and shall be able to enable, disable, and change the values of objects in the system.

2.6 POWER FAIL RESTART

- A. In the event of the loss of normal power, there shall be an orderly shutdown of the digital panels and workstation to prevent the loss of data base or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data, and battery backup shall be provided to support the clock and all volatile memory for a minimum of 4 hours.
- B. Upon restoration of normal power, the panels shall automatically resume full operation without manual intervention.
- C. Should Digital panel memory be lost for any reason, the user shall have the capability of reloading the panel via the local RS-232 port, or telephone line dial-in.

2.7 SYSTEM SOFTWARE

- A. Furnish the following applications software for building and energy management. All software applications shall reside and run in the system controllers. Editing of applications shall occur at the operator workstation.
- B. System Security
 1. User access shall be secured using individual security passwords and user names.
 2. Passwords shall restrict the user to only the objects, applications, and system functions as assigned by the system manager.

3. User logon/logoff attempts shall be recorded.
 4. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.
- C. Scheduling. Provide the capability to schedule each object or group of objects in the system. Each of these schedules shall include the capability for start, stop, optimal start, optimal stop, nightsetback, and economizer actions. Each schedule may consist of up to 10 events. When a group of objects are scheduled together, provide the capability to define advances and delays for each member. Each schedule shall consist of the following:
1. Weekly Schedule. Provide separate schedules for each day of the week. Provide separate scheduling that is easily edited by the operator to define the occupied hours for each classroom, gym, lab, and room.
 - a. All spaces served by a heat pump shall have the option to maintain night-set-back temperatures or occupied temperatures.
 2. Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. This exception schedule shall override the standard schedule for that day. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed it will be discarded and replaced by the standard schedule for that day of the week.
 - a. Specifically label and program "snow day" to keep the building in the unoccupied mode with the option to set back the temperature or to bring it up to the occupied setpoint.
 3. Holiday Schedules. Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.
 4. Optimal Start/Stop. The TCC will create an "Optimal Start" program/schedule, in addition to an Occupied program/schedule for all HVAC equipment with outdoor air capability. Note: control of start/stop is required for each fan in multi-fan equipment.
 - a. The Optimal Start program is used primarily during the morning warm up period but may be scheduled at several other times of day. When the program is enabled it should adjust the unoccupied temperature setpoint (either heating or cooling) to the occupied setpoint (73° heating, 75° cooling) with a differential of 1°. The program will allow the supply fan to run only on a call for heating or cooling. Outside air dampers will remain closed during the Optimal Start mode. When the program is disabled, it should adjust the unoccupied setpoint (60° heating, 95° cooling) with a differential of 6°. All setpoints shall be adjustable. The setpoints should be programmed as follows:
 - 1) OpSt Enabled - Fan On - Heating: 73°F, Cooling: 75°F
 - 2) OpSt Enabled - Fan Off - Heating: 72°F, Cooling: 76°F
 - 3) OpSt Disabled - Fan On - Heating: 66°F, Cooling: 89°F
- D. Alarm Reporting. The operator shall be able to determine the action to be taken in the event of an alarm. Alarms shall be routed to the appropriate workstations based on time and other conditions. An alarm shall be able to start programs, be logged in the event log, printed, and generate custom messages.
- E. Remote Communications. The system shall have the ability to dial out in the event of an alarm. Receivers shall include PC Workstations and text messages to cell phones. The alarm message shall include the name of the calling location, the device that generated the alarm, and the

alarm message itself. The operator shall be able to remotely access and operate the system using dial up communications.

- F. Maintenance Management. The system shall monitor equipment status and generate maintenance messages based upon user designated run time, starts, and/or calendar date limits.
- G. Staggered Start. This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts shall be user-selectable.

2.8 BUILDING CONTROLLERS

- A. General. Provide BACnet Building Controllers (B-BC) to provide the performance specified in this section. Each of these B-BC devices shall meet the following requirements.
 - 1. The Building Automation System shall be composed of one or more independent, stand-alone, microprocessor based Building Controllers to manage the global strategies described in System software section.
 - 2. The Building Controller shall have sufficient memory to support its operating system, database, and programming requirements.
 - 3. The controller shall provide a communications port for connection of a Portable Operators Terminal.
 - 4. The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
 - 5. Data shall be shared between networked Building Controllers.
 - 6. The Building Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:
 - a. Assume a predetermined failure mode.
 - b. Generate an alarm notification.
- B. Environment. Controller hardware shall be suitable for the anticipated ambient conditions. Controller used in conditioned ambient shall be mounted in an enclosure, and shall be rated for operation at 32 F to 120 F.
- C. Serviceability. Provide diagnostic LEDs for power, communications, and processor. All wiring connections shall be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable.
- D. Memory. The Building Controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.
- E. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shut-down below 80% nominal voltage.

2.9 CUSTOM OR ADVANCED APPLICATION CONTROLLERS

- A. General. Provide BACnet Advanced Application Controllers (B-AAC) to provide the performance specified in this specification. Each of these B-AAC devices shall meet the following requirements.
 - 1. The Building Automation System shall be composed of one or more independent, stand-alone, microprocessor based Building Controllers to manage the local strategies described in System software section.

2. The Controller shall have sufficient memory to support its operating system, database, and programming requirements.
 3. The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
 4. Data shall be shared between networked Controllers.
 5. The Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:
 - a. Assume a predetermined failure mode.
 - b. Generate an alarm notification.
- B. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.
1. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA Type 4 waterproof enclosures, and shall be rated for operation at -40° F to 150° F.
 2. Controllers used in conditioned ambient shall be mounted in dust-proof enclosures, and shall be rated for operation at 32° F to 120° F.
- C. Serviceability. Provide diagnostic LEDs for power, communications, and processor. All wiring connections shall be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable.
- D. Memory. The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.
- E. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shut-down below 80% nominal voltage.

2.10 APPLICATION SPECIFIC CONTROLLERS

- A. General. Provide BACnet Application Specific Controllers (B-ASC), microprocessor-based DDC controllers which through hardware or firmware design are dedicated to control a specific piece of equipment. They are not fully user programmable, but are customized for operation within the confines of the equipment they are designed to serve.
1. Each B-ASC shall be capable of stand-alone operation and shall continue to provide control functions without being connected to the network.
 2. Each B-ASC will contain sufficient I/O capacity to control the target system.
- B. Environment. The hardware shall be suitable for the anticipated ambient conditions.
1. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA Type 4 waterproof enclosures, and shall be rated for operation at -40° F to 150° F.
 2. Controller used in conditioned ambient shall be mounted in dust-proof enclosures, and shall be rated for operation at 32° F to 120° F.
- C. Serviceability. Provide diagnostic LEDs for power, and communications. All wiring connections shall be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable.
- D. Memory. The BACnet Application Specific Controller shall maintain all BIOS and programming information in the event of a power loss for at least 90 days.

- E. Immunity to Power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shut-down below 80%.
- F. Transformer. Power supply for the B-ASC must be rated at minimum of 125% of ASC power consumption, and shall be fused or current limiting type.

2.11 COMMUNICATIONS

- A. The controls Contractor shall provide all communication media, connectors, repeaters, hubs, and routers necessary for the inter-network.
- B. All Building Controllers shall have a communications port for connections with the operator interfaces.
- C. Communications services over the inter-network shall result in operator interface and value passing that is transparent to the inter-network architecture as follows:
 - 1. Connection of an operator interface device to any one controller on the inter-network will allow the operator to interface with all other controllers as if that interface were directly connected to the other controllers. Data, status information, reports, system software, custom programs, etc., for all controllers shall be available for viewing and editing from any one controller on the inter-network.
 - 2. All database values (i.e. points, software variable, custom program variables) of any one controller shall be readable by any other controller on the inter-network. This value passing shall be automatically performed by a controller when a reference to a point name not located in that controller is entered into the controller's database. An operator/installer shall not be required to set up any communications services to perform inter-network value passing.
- D. The time clocks in all controllers shall be automatically synchronized daily.

2.12 INPUT/OUTPUT INTERFACE

- A. Hard-wired inputs and outputs may tie into the system through Building, Custom, or Application Specific Controllers.
- B. All input points and output points shall be protected such that shorting of the point to itself, another point, or ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24V of any duration, such that contact with this voltage will cause no damage to the controller.
- C. Binary inputs shall allow the monitoring of on/off signals or from remote devices. The binary inputs shall provide a wetting current of at least 12 ma to be compatible with commonly available control devices.
- D. Pulse accumulation input points. This type of point shall conform to all the requirements of Binary Input points, and also accept up to 2 pulses per second for pulse accumulation, and shall be protected against effects of contact bounce and noise.
- E. Analog inputs shall allow the monitoring of low voltage (0-10 Vdc), current (4-20 ma), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with, and field configurable to commonly available sensing devices.
- F. Binary outputs shall provide for on/off operation, or a pulsed low voltage signal for pulse width modulation control. Outputs shall be selectable for either normally open or normally closed operation.
- G. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0-10 Vdc or a 4-20 ma signal as required to provide proper control of the output device.

2.13 AUXILIARY CONTROL DEVICES

- A. Devices, components and hardware, either specified or required to control the mechanical system, shall comply with the requirements of the related Division 23 specification section.
- B. Contractor limited to device manufacturers identified. Where not specified, provide component by manufacturer of choice.
- C. Electronic valve actuators.
 - 1. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator. Furnish a separate damper actuator for each damper greater than 48" in any dimension.
 - 2. Where shown, for power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing.
 - 3. All rotary spring return actuators shall be capable of both clockwise and counter clockwise spring return operation. Linear actuators shall spring return to the retracted position.
 - 4. Proportional actuators shall accept a 0-10 VDC or 0-20 ma control signal and provide a 2-10 VDC or 4-20 ma operating range.
 - 5. All 24 VAC/DC actuators shall not require more than 10 VA for AC or more than 8 W for DC applications. Actuators operating on 120 VAC or 230 VAC shall not require more than 11 VA.
 - 6. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb. torque capacity shall have a manual crank for this purpose.
 - 7. All modulating actuators shall have an external, built-in switch to allow the reversing of direction of rotation.
 - 8. Actuators shall be provided with a conduit fitting and a minimum 1m electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
 - 9. Actuators shall be Underwriters Laboratories Standard 873 listed.
 - 10. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque. Actuators shall include a stroke limiting device.
- D. Control Valves
 - 1. Provide each mechanical hydronic unit with a dedicated automatic control valve. Valves shall be two-way or three-way, two position or modulating, as scheduled or indicated in the sequence of operation, all of which apply to piping bypasses. Each major run of piping (serving more than three mechanical units) shall be provided a valved bypass; each valved bypass shall be controlled by a dedicated differential pressure sensor.
 - 2. Control valves shall be two-way or three-way type for two-position or modulating service as scheduled, shown, or as indicated in the sequence of operation.
 - 3. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:
 - a. Water Valves:
 - 1) Two-way: 150% of total system (pump) head.

- 2) Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.

4. Water Valves:

- a. Body and trim style and materials shall be per manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.
- b. Sizing Criteria:
 - 1) Two-position service: Line size.
 - 2) Three-way Modulating Service: Pressure drop equal to the pressure drop through the coil exchanger (load), 3 psi maximum. End of line valves at bypass shall be line size.
 - 3) Valves 1/2" through 2" shall be bronze body or cast brass ANSI Class 250, spring loaded, Teflon packing, quick opening for two-position service. Two-way valves to have replaceable composition disc, or stainless steel ball.
 - 4) 2-1/2" valves and larger shall be cast iron ANSI Class 125 with guided plug and Teflon packing.

E. Sensors:

1. Room and duct humidity sensors shall be of the thin film capacitance type containing a humidity sensitive material that modifies its dielectric constant to maintain accuracy of + 5% RH @ 77° F, range of 20% to 95% RH, including hysteresis, linearity, and repeatability. The sensor shall be rated for operation between 15 to 170 degrees F.
2. All temperature and humidity sensors shall be of the electronic type. The temperature sensors shall be resistance temperature device (RTD) or thermistor type.
 - a. Room sensors shall include covers for horizontal or vertical mounting and concealed adjustments. Sensors shall include adjustable slide temperature sensors, and two-hour push button override. All wall sensors located on exterior walls or surfaces that will cause abnormal sensor readings shall be furnished with an insulated base.
 - b. Room sensors shall have a range of 32-120 degrees F with a factory calibration of 74° F. Accuracy shall be plus or minus 1degree F at calibration point. Mounting height of room sensors shall be verified with owner prior to installation.
 - c. Duct Temperature Sensors - accuracy of + 1° F @ 77 deg F. Duct air sensors shall be duct single point, averaging probe or averaging bulb as required under sequence of operation.
 - d. Sensors located in areas of common areas (i.e. high density occupancy, gathering spaces and/or foot traffic) shall be provided with high impact steel cage thermostat/sensor guards, including but not limited to corridors, athletic spaces and mechanical-electrical-utility spaces. Cage guards shall be Schneider model AT-1163 or equivalent.
 - e. Mounting: typical space sensors at 48" above floor to center; sensors in common areas at 96" above floor to center. Coordinate mounting locations with light switches.

- f. Outside air sensor shall have watertight inlet fitting and contain a shield from direct sunlight.
- 3. Duct pressure sensors shall be compatible for use in HVAC air distribution or air handling systems and shall have an accuracy of plus or minus .1" w.g. Sensors shall have an operating temperature range from 0-175° F and 10-90% relative humidity. Sensors shall be Mamac Systems or approved equal.
- 4. The Carbon Dioxide sensors shall have a measurement range from zero to 2000 parts per million (ppm) and an initial accuracy of plus or minus 20 ppm with a deviation of no more than 100 ppm after two years of continuous service. The response time shall not exceed 120 seconds. The operating temperature shall be between 55° F and 90° F and the operating relative humidity range shall be from 5 to 100%. The carbon dioxide sensor shall be by Vaisala or Engineer approved equal.
- F. Differential Pressure Switch (static) - shall sense static differential pressure for negative application (exhaust air duct), positive pressure (supply duct), or a differential pressure switch (filters) and shall be automatic reset type with an adjustable range from .05-12" WC.
- G. Current Sensing Relays - shall be split core type with adjustable high and low trip settings. Range shall not exceed 175% of expected input. Coordinate special requirements for systems with variable speed drives. Relays shall be the Hawkeye series by Veris Industries.
- H. Flow Switches
 - 1. Flow-proving switches shall be either paddle or differential pressure type for proof of flow application.
 - 2. Differential pressure type switches (air or water service) shall be UL listed, solid state, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA Type 1 enclosure, with scale range and differential suitable for intended application, or as specified. Mercoid type switches shall not be used for equipment that vibrates such as chillers, etc. Differential pressure switches shall be by Orange Research or approved equal.
 - 3. Current sensing relays may be used for flow sensing or terminal devices.
- I. Relays
 - 1. Control relays shall be UL listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application.
 - 2. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable plus or minus 200% (minimum) from set-point shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA Type 1 enclosure when not installed in local control panel.
- J. Transformers and Power Supplies
 - 1. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.
 - 2. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.
 - 3. Unit shall operate between 0° C and 50° C.
 - 4. Unit shall be UL recognized.

K. Local Control Panels

1. All indoor control cabinets shall be fully enclosed NEMA Type 1 construction with hinged door, key-lock latch, removable sub-panels. A single key shall be common to all field panels and sub-panels.
2. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control termination's for field connection shall be individually identified per control drawings.

L. Auxiliary Devices

1. Furnish and install all necessary auxiliary electronic devices as appropriate to accomplish the sequence as specified. These totally electronic devices shall include (but not be limited to) such items as load limiting controllers, low signal selectors, high signal selectors, remote reset control devices, floating alarm units, staging networks, damper position indicators, unison amplifiers, reversing networks, sequencing networks and electronic power supplies.

M. Variable Frequency Drives

1. The Div. 26 contractor shall be responsible for providing and installing variable frequency drives.
2. TCC and Div. 26 contractors shall be present at startup of the variable frequency drive.
3. TCC shall provide all interconnections necessary for full integration into the BAS and associated equipment.

2.14 WIRING

- A. All electric wiring required for the control system and any interlock wiring required for the controls sequence shall be provided by the Temperature Control Contractor.
- B. All line voltage control wiring shall be run in conduit. Reference Division 16 for requirements.
- C. Wire shall be a minimum of #18 gauge, color coded, stranded wire for all low voltage, electronic circuit with "spares" installed (one for every group of 10 wires) in conduit. Unconcealed wire (wire not in conduit) shall be the specific product of the TCC, with unique identifiers of the TCC manufacturer-marked on wire minimum 2 feet on center; field applied labels or flags are not acceptable. Submit samples with shop drawings for review.
- D. Coordinate the requirements for 120V circuits for the ASC's. All control transformers shall be the responsibility of this contractor. Reference the electrical drawings for circuit locations.

2.15 SEQUENCE OF OPERATION

A. General

1. All HVAC equipment control points recognized by the controllers, both factory and field installed, shall be integrated into the new BAS for full control and manipulation via the operator's interface/workstation.
2. Control points (i.e. Indications, Adjustments, Alarms, faults, remote reset, etc.) as identified shall be provided as equipment manufacturer's factory options. Where the specified item is not available as a factory option, the equipment manufacturer shall coordinate with the TCC to provide. All non-factory option solutions shall be highlighted within the shop drawing submittals of both the equipment manufacturer and the TCC.

3. Each piece of equipment with potential of being automatically locked out of operation due to unit fault(s) shall be capable of being reset remotely from the District's central workstation. Specific procedures to do so shall be demonstrated for each type of equipment installed on this project.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Controls contractor shall coordinate ethernet drop locations with Division 26 and Division 26 will provide drops.
- B. Owner shall provide IP address to all network drops and active the point on their network.
- C. Install wiring in a neat and workmanlike manner. Wiring to finished spaces shall be run concealed.
- D. All work is to be installed by a qualified person skilled in the installation of electronic control systems. The control company representative is responsible for the proper installation of the control system and will provide supervision of the installation.
- E. Wire the flow switches and other chiller control devices not factory wired. Reference the chiller specification.
- F. Install damper actuators for all automatic dampers.
- G. Install terminal equipment controllers on terminal boxes and provide all necessary control wiring.
- H. Install system and materials in accordance with manufacturer's instructions and roughing -in drawings, and details and drawings. Install electrical work and use electrical products complying with requirements of applicable Division 26 sections of these specifications. Mount controllers at convenient locations and heights.
- I. Wiring. The term "wiring" is defined to include providing of wire, conduit and miscellaneous materials as required for mounting and connecting electric control devices.
- J. Wiring System. Install complete wiring system for electric-electronic temperature controls. Conceal wiring, except in mechanical rooms and areas where other conduit and piping are exposed. Provide multi-conductor instrument harness (bundle) in place of single conductors where number of conductors can be run along common path. Fasten flexible conductors bridging cabinets and doors, neatly along hinge side, and protect against abrasion. Tie and support conductors neatly.
- K. Number-code or color-code conductors, appropriately for future identification and servicing of control system.

3.2 ON-SITE TESTING

- A. Provide Engineer and/or Owner approved operation and acceptance testing of the complete system. The Engineer and/or Owner will witness all tests.
- B. Field Test. When installation of the system is complete, calibrate equipment and verify transmission media operation before the system is placed in line. All testing, calibrating, adjusting and final field tests shall be completed by the installer. Provide a cross-check of each control point within the system by making a comparison between the control command and the field-controlled device. Verify that all systems are operable from local controls in the specified failure mode upon panel failure or loss of power. Submit the results of functional and diagnostic tests and calibrations to the Engineer for final system acceptance.

- C. Compliance Inspection Checklist. Submit in the form requested, the following items of information to the Owner's representative and Architect/Engineer for verification of compliance to the project specifications. Failure to comply with the specified information shall constitute non-performance of the contract. The contractor shall submit written justification for each item in the checklist that he is unable to comply with. The Owner's Representative and the Architect/Engineer will initial and date the checklist to signify Contractor's compliance before acceptance of system.
1. Verify to the Owner's Representative and Architect/Engineer in letter form that supplier has in-place support facility. Letter shall show location of support facility, name and titles of technical staff, engineers, supervisors, fitters, electricians, managers and all other personnel responsible for the completion of the work on this project

User _____ Date _____ A/E _____ Date _____
 2. Manually generate an alarm at the remote DDC Controller as selected by the Architect/Engineer to demonstrate the capability of the workstation and alarm printer to receive alarms within 5 seconds.

User _____ Date _____ A/E _____ Date _____
 3. Disconnect one DDC Controller from the network to demonstrate that a single device failure shall not disrupt or halt peer-to-peer communication. Panel to be disconnected shall be selected by the Architect/Engineer.

User _____ Date _____ A/E _____ Date _____
 4. At a DDC Controller of the Architect/Engineer's choice, display on the portable operator's terminal:
 - a. At least one temperature setpoint and at least one status condition; i.e.: on or off for a system or piece of equipment attached to the panel as well as for points at another DDC Controller on the network.
 - b. The diagnostic results as specified for a system or piece of equipment attached to that panel as well as for a system or piece of equipment attached to another DDC Controller.
 - c. The ability to add a new point to the DDC Controller with the POT and have it automatically uploaded to the workstation to modify that panel's stored database.
User _____ Date _____ A/E _____ Date _____
 5. At the Architect/Engineer's choice, disconnect the trunk connection to demonstrate its lack of reliance on a DDC Controller to maintain full control functionality.

User _____ Date _____ A/E _____ Date _____

3.3 SERVICE AND GUARANTEE

- A. General Requirements. Provide all services, materials and equipment necessary for the successful operation of the entire BAS System for a period of one year after completion of successful performance test. Provide necessary material required for the work. Minimize impacts on facility operations when performing scheduled adjustments and non-scheduled work.
- B. Description of Work. The adjustment and repair of the system includes all computer equipment, software updates, transmission equipment and all sensors and control devices. Provide the manufacturer's required adjustment and all other work necessary.

- C. Personnel. Provide qualified personnel to accomplish all work promptly and satisfactorily. Owner shall be advised in writing of the name of the designated service representative, and of any changes in personnel.
- D. Schedule of Work. Provide two minor inspections at 6 month intervals and two major inspections offset equally between the minor inspections to effect quarterly inspection of alternating magnitude, and all work required as specified. Schedule major inspections in July and January. Minor inspections shall include visual checks and operational test of all equipment delivered. Major inspections shall include all work described for minor inspections and the following work:
 - 1. Clean all equipment, including interior and exterior surfaces.
 - 2. Perform signal, voltage and system isolation checks of system workstations and peripherals.
 - 3. Check and calibrate each field device. Check all analog points and digital points.
 - 4. Run all diagnostics and correct all previously diagnosed problems.
 - 5. Resolve and correct any previous outstanding problems.
- E. Emergency Service. Owner shall initiate service calls when the system is not functioning properly. Qualified personnel shall be available to provide service to the complete system. Furnish Owner with a telephone number where service representative can be reached at all times. Service personnel shall be at the site within 4 hours after receiving a request for service. Restore the control system to proper operating condition within 24 hours.
- F. Operation. Performance of scheduled adjustment and repair shall verify operation of the system as demonstrated by the initial performance test.
- G. Systems Modifications. Provide any recommendations for system modification in writing to Owner. Do not make any system modifications, including operating parameters and control settings, without prior approval of Owner. Any modifications made to the system shall be incorporated into the operations and maintenance manuals, and other documentation affected.
- H. Software. Provide all software updates and verify operation in the system. These updates shall be accomplished in a timely manner, fully coordinated with the system operators, and shall be incorporated into the operations and maintenance manuals, and software documentation.

3.4 EXAMINATION

- A. The project plans shall be thoroughly examined for control device and equipment locations, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

3.5 GENERAL WORKMANSHIP

- A. Install equipment, piping, wiring/conduit parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install all equipment in readily accessible location as defined by chapter 1 article 100 part A of the NEC. Control panels shall be attached to structural walls unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.
- D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

- E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.
- F. Coordinate with the testing and balancing contractor to adjust low leakage dampers if damper leak rate exceeds specifications.

3.6 INSTALLATION OF SENSORS

- A. Install sensors in accordance with the manufacturer's recommendations.
- B. Mount sensors rigidly and adequate for the environment within which the sensor operates.
- C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing and coordinated with light switches.
- D. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor readings.
- E. Install duct static pressure tap with tube end facing directly down-stream of airflow.
- F. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.
- G. All pipe mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat conducting fluid in thermal wells.
- H. Wiring for space sensors shall be concealed in building walls. EMT conduit is acceptable within mechanical and service rooms.
- I. Install outdoor air temperature sensors on north wall complete with sun shield at designated location.

3.7 FLOW SWITCH AND PRESSURE DIFFERENTIAL SWITCH INSTALLATION

- A. Install using a thread-o-let in steel pipe. In copper pipe use C x C x F Tee, no pipe extensions or substitutions allowed.
- B. Mount a minimum of 5 pipe diameters up stream and 5 pipe diameters downstream or 2 feet which ever is greater, from fittings and other obstructions.
- C. Install in accordance with manufacturer's instructions.
- D. Assure correct flow direction and alignment.
- E. Mount in horizontal piping - flow switch on top of the pipe.
- F. Pressure differential switches mounted on horizontal sections of pipe shall be installed on the side or top of pipes to avoid accumulation of debris.

3.8 ACTUATORS

- A. Mount and link control damper actuators per manufacturer's instructions.
- B. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
- C. Valves - Actuators shall be mounted on valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following manufacturer's recommendations.

3.9 WARNING LABELS

- A. Affix plastic labels on each starter and equipment automatically controlled through the Control System including all air handling unit fans at doors. Label shall indicate the following:

C A U T I O N

This equipment is operating under
automatic control and may start at
any time without warning.

3.10 IDENTIFICATION OF HARDWARE AND WIRING

- A. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 2" of termination with a cable identifier and other descriptive information.
- B. Permanently label or code each point of field terminal strips to show the instrument or item served.
- C. Identify control panels with minimum 1 cm letters on laminated plastic nameplates.
- D. Identify all other control components with permanent labels. Identifiers shall match record documents All plug-in components shall be labeled such that removal of the component does not remove the label.

3.11 CONTROLLERS

- A. Provide a separate Controller for each major piece of HVAC equipment. Points used for control loop reset such as outside air or space temperature are exempt from this requirement.
- B. Building Controllers and Custom Application Controllers shall be selected to provide a minimum of 15% spare I/O point capacity for each point type found at each location. If input points are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point used.
- C. Future use of spare capacity shall require providing the field device, field wiring, point database definition, and custom software. No additional Controller boards or point modules shall be required to implement use of these spare points.
- D. Only like-controllers from the same manufacturer shall reside on a given buss, to prevent any negative feedback potential between dissimilar objects. The number of objects on a given buss shall not exceed the manufacturer's recommendation, and shall be determined by the manufacturer's conservative estimate. For example, if a controller manufacturer recommends the number of objects be limited to 32-48 objects, then work of this Section will be limited to the lower value of 32. This shall be explicitly identified in the shop drawing submittal.

3.12 PROGRAMMING

- A. Provide sufficient internal memory for the specified control sequences and trend logging. There shall be a minimum of 25% of available memory free for future use.
- B. Point Naming. System point names shall be modular in design, allowing easy operator interface without the use of a written point index.
- C. Software Programming
 - 1. Provide programming for the system as per specifications and adhere to the strategy algorithms provided. All other system programming necessary for the operation of the system but not specified in this document shall also be provided by the Control System Contractor. Imbed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequence of operations.

D. Operators' Interface

1. Standard Graphics. Provide graphics for each major piece of equipment and floor plan in the building that match the DOC's Standard Graphics. This includes pumps, exhaust fans, heat pumps and ventilation heat pumps. These standard graphics shall show all points dynamically as specified in the points list.
2. The controls contractor shall provide all the labor necessary to install, initialize, start-up, and trouble-shoot all operator interface software and their functions as described in this section. This includes any operating system software, the operator interface data base, and any third party software installation and integration required for successful operation of the operator interface.
3. As part of this execution phase, the controls contractor will perform a complete test of the operator interface. Test duration shall be a minimum of 16 hours on-site. Tests shall be made in the presence of the Owner or Owner's representative.

E. Demonstration. A complete demonstration and readout of the capabilities of the monitoring and control system shall be performed. The contractor shall dedicate a minimum of 4 hours on-site with the Owner and his representatives for a complete functional demonstration of all the system requirements. This demonstration constitutes a joint acceptance inspection, and permits acceptance of the delivered system for on-line operation.

F. Software Backup

1. Once the demonstration has been completed to the satisfaction of the Owner, provide a complete software backup of the entire building system. Where projects are to be completed in phases, also provide a copy of the building's programmed software in existence prior to the start of the project.

3.13 CLEANING

- A. This contractor shall clean up all debris resulting from his or her activities daily. The contractor shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Construction Manager or General Contractor.
- B. At the completion of work in any area, the Contractor shall clean all of his/her work, equipment, etc., making it free from dust, dirt and debris, etc.
- C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage, and any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.14 PROTECTION

- A. The Contractor shall protect all work and material from damage by his/her work or workers, and shall be liable for all damage thus caused.
- B. The Contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The Contractor shall protect his/her work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.15 FIELD QUALITY CONTROL

- A. All work, materials and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this Section.

- B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.
- C. Contractor shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

3.16 ACCEPTANCE

- A. The control systems will not be accepted as meeting the requirements of Completion until all tests described in this specification have been performed to the satisfaction of both the Engineer and Owner. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Owner's representative. Such tests shall then be performed as part of the warranty.

END OF SECTION

SECTION 23 2113
HYDRONIC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Provide equipment, materials, tools, labor, and supervision necessary to furnish, fabricate, and install complete piping system.

1.2 STANDARDS AND CODES

- A. Pipe materials specified in this Section shall apply to technical sections of Division 23 of the Project Manual where applicable. Special requirements as may be called for in the technical sections, or shown on the Drawings, shall take precedence over General Requirements herein. Piping located in plenums shall be plenum rated for fire and smoke.

1.3 PRODUCT HANDLING

- A. Provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage, and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.
- B. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping.
- C. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

1.4 SUBMITTALS

- A. Submit piping schedule listing each pipe material used and systems served.
- B. Product Data for Hose Kits shall also include pressure drop.
- C. Submit Shop Drawings and Product Data which shall include product description, manufacturer, and size.

PART 2 PRODUCTS

2.1 MATERIAL

- A. Pipe Material and Service
 - 1. Black steel pipe ERW, Schedule 40, ASTM A53: heating water and geothermal loop piping (all pipe sizes).
 - 2. Polypropylene (PP-R) pipe (Aquatherm Blue Pipe, Niron or Engineer pre-approved equivalent), SDR 17.6, ASTM F 2389 (piping 4" and larger); SDR 11, ASTM F 2389 (2" to 3"): geothermal loop piping
- B. Fittings
 - 1. Threaded pipe - malleable iron fittings, 125-pound standard flat band water pattern.
 - 2. Welded pipe - welded neck fittings and welded neck flanges, same material and strength as pipe.
 - 3. Grooved fittings –may be used for heating water and geothermal loop piping, as approved by Code. Grooved fittings shall be Victaulic or Grulock.
 - 4. Carbon steel pipe - material and strength shall correspond to pipe specifications. ANSI B31.5.

5. Polypropylene (PP-R) pipe - material and strength shall correspond to pipe specifications, ASTM F 2389.

C. Joints

1. Threaded pipe - make joints using approved pipe joint compound, applied to male threads only. Cut pipe square, cut threads clean, remove burrs, and ream ends to full size of bore. Threads shall not be exposed on chromium-plated pipe.
2. Threadless brass pipe - use brazing alloy which will flow freely at 1300° F, use flux and brazing method as recommended by manufacturer of brazing alloy.
3. Welded pipe - welding shall conform to welding section of ANSI B31.1 "Code for Power Piping". Pipe up to 2" diameter shall be screwed. Pipe 2-1/2" diameter and over shall be welded.
4. Polypropylene (PP-R) pipe - Install fittings and joints using socket-fusion, electrofusion, or butt-fusion as applicable for the fitting or joint type in accordance with the pipe and fitting manufacturer's specifications and product standards.

D. Nipples and Unions

1. Nipples shall conform to size, weight, and strength of adjoining pipe. When length of unthreaded portion of nipple is less than 1-1/2", use extra strong nipple; do not use close nipples.
2. For pipe 3" and smaller, use screwed unions; over 3", use flanged unions. For steel and wrought iron pipe, use malleable iron ground joint unions, black or galvanized, to conform to pipe. Cast iron flanged unions are to be gasket type. For threaded brass pipe, use bronze ground joint unions with octagon ends. Install unions on equipment intended to be disassembled.
3. Dielectric unions shall not be used. Provide Victaulic Style 47 "water way" or Gruvlok 7091 fittings at joints between steel and copper components.

2.2 EXPANSION TANKS – NON-POTABLE SYSTEMS

- A. Provide expansion tanks of size and number as indicated. Construct tank of welded steel, constructed, tested, and stamped in accordance with Section VIII of ASME Boiler and Pressure Vessel Code for a working pressure of 125 psi. Furnish National Board Form U-1 denoting compliance. Support vertical tanks with steel legs or base; support horizontal tanks with steel saddles or hangers. Provide replaceable heavy-duty butyl rubber bladder to permanently separate air charge from system water and to maintain design expansion capacity. Provide pressure gauge, lifting rings, floor mounting skirt, and drain fitting.
- B. Tank bladder shall allow for full acceptance volume.
- C. Manufacturer: Expansion tanks shall be Amtrol, Inc., Armstrong, Bell & Gossett ITT, Taco, Inc., Wessels or Engineer pre-approved equivalent.

2.3 AIR SEPARATORS

- A. Air Separators: Provide air separators as indicated. Construct sizes 1-1/2" and smaller of cast iron; and sizes 2" and larger of steel, complying with ASME Boiler and Pressure Vessel Code and stamped with "U" symbol. Furnish National Board Form U-1 denoting compliance.
- B. Provide unit with integral strainer.
- C. Manufacturer: Subject to compliance with requirements, provide air separators manufactured by Spirotherm VDT, Taco Series 4900 or Engineer pre-approved equivalent.

2.4 AIR VENTS

- A. Manual air vents, equivalent to B & G No. 17 SR.
- B. Automatic Vent Valves: Provide automatic vent valves designed to vent automatically with float principle, stainless steel float and mechanisms, cast-iron body, pressure rated for 125 psi, minimum 3/4" NPS inlet and outlet connections. Equivalent to Bell & Gossett #7 or #87 (#107A for high capacity where noted on Drawings), with copper overflow connection.
- C. Manufacturer: Subject to compliance with requirements, provide vent valves by Bell & Gossett-ITT Fluid Handling Division, Hoffman Specialty-ITT Fluid Handling Divisions, Spirax/Sarco, Watson-McDaniel Co., or Engineer pre-approved equivalent.

2.5 FLOW BALANCING

- A. Calibrated Balance Valves (Ball Type) with Flow Meter Fittings:
 - 1. Provide as indicated, calibrated balance valves equipped with readout ports to facilitate connecting of differential pressure meter to balance valves. Valves shall provide precise flow measurement, precision flow balancing and positive shut-off with no drip seat. Valves shall have memory stop feature to allow valve to be closed for service and then re-opened to set point without disturbing balance position. Provide calibrated nameplate or division ring scale to indicate degree of precision-machined orifice. Valves to be leak tight at full-rated working pressure. All valves to be provided with molded insulation to permit access for balancing and readout.
 - 2. Circuit setters need not be line size, but shall be sized for specific application.
 - 3. Provide balancing devices designed for low flow applications for flows 1 GPM and lower.
 - 4. Manufacturer:
 - a. Subject to compliance with requirements, provide calibrated balance valves by Armstrong, Bell & Gossett, Griswold, Taco, Inc., or Engineer pre-approved equivalent.
- B. Calibrated Balance Valve (Globe Type) with Flow Meter Fittings
 - 1. Provide as indicated, calibrated balance valves equipped with two metering/test ports with internal check valves and protective caps to facilitate connecting to differential pressure meter to balance valves.
 - 2. Valve shall be globe style and shall provide precise flow measurement, precision flow balancing and positive shut-off with no drip seat. Valve shall be leak tight at full rated pressure.
 - 3. Valves shall have memory stop feature to allow valve to be closed for service and then re-opened to set point without disturbing balance position. Provide calibrated nameplate or division ring scale to indicate valve position.
 - 4. Valve need not be line size, but shall be sized for specific application.
 - 5. Provide balance valves designed for low flow applications for flows of 1 GPM and lower.
 - 6. Valves 1/2" through 2" shall be constructed of dezincification resistant brass or bronze alloy.
 - 7. Valves 2 1/2" through 12" shall be constructed of iron with ANSI Class 125/150 flanged or grooved ends.
 - 8. Manufacturer: Subject to compliance with requirements, provide calibrated balance valves by Nibco, Armstrong, Grinnell or Engineer pre-approved equivalent.

2.6 VENTURI TYPE FLOW METER FITTING (PIPING SYSTEM ≥ 2 ", INCLUDING PUMP INSTALLATIONS)

- A. General: Provide flanged, carbon steel low loss Venturi type flow meter equipped with butterfly valve and outlet readout valves to facilitate connecting of differential pressure meter to flow meter. Equip each readout valve with integral EPT check valve designed to minimize system fluid loss during monitoring process. Provide calibrated nameplate with flow meter detailing its flow range through range of differential head pressures. Venturi should be sized to produce gauge reading in the center of scale during design flow.
- B. Electronic Flow Transducer (EFT) system: For each venturi flow meter, provide a Griswold EFT with differential pressure transducer for generation of electronic output signal to communicate flowrate to the BAS; EFT is a bolt-on kit for field installation. Coordinate specific output signal as preferred by temperature controls contractor prior to ordering.
 - 1. Provide manufacturer's optional filter to eliminate potential noise frequency due to turbulence.
 - 2. Air must be bled from the DPT. Follow manufacturer's written instructions to successfully remove trapped air.
 - 3. Temperature controls contractor shall provide a display for local observation in the mechanical room.
- C. Provide flow meter test kit
- D. Manufacturer: Subject to compliance with requirements, provide Griswold Quickset Venturi flow meter fittings or equivalent by Aeroquip, Barco, Presco or Engineer pre-approved equivalent.

2.7 TEMPERATURE AND PRESSURE GAUGE CONNECTOR TAPS

- A. Provide temperature gauge connector taps pressure rated for 500 psi and 200° F (90° C). Construct of brass and finish in nickel-plate, equip with 1/2" NPS fitting, with self-sealing valve core type neoprene gasketed orifice suitable for inserting 1/8" O.D. probe assembly for dial type insertion thermometer. Equip orifice with gasketed screw cap and chain. Provide extension, length equal to insulation thickness, for insulated piping.
- B. Provide one test kit.
- C. Manufacturer: Subject to compliance with requirements, provide gauge connector taps manufactured by Peterson Engineering Co., Sisco, Trerice, or Engineer pre-approved equivalent.

2.8 FLEXIBLE CONNECTORS

- A. Flexible connectors through 4 in. size shall be fabricated of a corrugated bronze inner tube with a braided wire stainless steel outer jacket. Tubes to be welded to pipe ends, threaded through 2 in. size, flanged for sizes 2-1/2 in. through 4 inches.
- B. Flexible connectors for pipe sizes larger than 4" shall be fabricated of nylon reinforced rubber with ductile iron flanges and control rods to limit travel.
- C. Manufacturer: Metraflex, Twin City Hose or Engineer pre-approved equivalent.

2.9 LOW PRESSURE Y-TYPE PIPELINE STRAINERS

- A. General: Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125 psi working pressure, with Type 304 stainless steel screens.
- B. Threaded Ends 2" and Smaller: Cast-iron body, screwed screen retainer with centered blow-down fitted valve for blow-down.
- C. Copper Piping 2" and Smaller: Use cast bronze strainer equal to Mueller #351 with blow-down valve and cap.

- D. Threaded End 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blow-down fitted with valve for blow-down. Fitted with 3/64 perforated screen.
- E. Flanged Ends 1-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blow-down fitted with valve for blow-down. Fitted with 3/64 perforated screen.
- F. Provide blow-down valve and cap or plug for each strainer.
- G. Manufacturer: Subject to compliance with requirements, provide Y-type strainers manufactured by, Armstrong, Hoffman Specialty, Metraflex, Mueller, Spirax/Sarco, Trane, Watts, or Engineer pre-approved equivalent.

2.10 SLEEVES

- A. Sleeves passing through non-load bearing walls and partitions shall be galvanized sheet steel with lock seam joints of minimum gauges as follows: For pipes 2-1/2" in size and smaller - 24-gauge; 3 in. to 6 in. - 22-gauge; over 6 in. - 20-gauge.
- B. Sleeves passing through load bearing walls, concrete beams, fireproof walls, foundations, footings, and waterproof floors shall be Schedule 40 galvanized steel pipe or cast iron pipe.
- C. Sleeves for insulated piping shall be of sufficient internal diameter to take pipe and insulation and to allow for free movement of pipe. Waterproof sleeves shall be of sufficient internal diameter to take pipe and waterproofing material.
- D. In finished areas where pipes are exposed, sleeves shall be terminated flush with wall, partitions and ceilings, and shall extend 1/2 in. above finished floors. Extend sleeves 1 in. above finished floors in areas likely to entrap water and fill space between sleeves and pipe with graphite packing and caulking compound.
- E. Sleeves passing through membrane waterproofing or roofing shall be flashed and sealed.

2.11 PIPE ESCUTCHEONS

- A. Provide pipe escutcheons with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extensions, if any. Furnish pipe escutcheons with chrome finish for occupied areas, prime paint finish for unoccupied areas.
- B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.
- C. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.
- D. Manufacturer: Chicago Specialty, Producers Specialty, Sanitary-Dash or Engineer pre-approved equivalent.

2.12 GUARDS

- A. Where exposed insulated piping extends through floor, provide sheet metal guard around insulation to extend up from floor 60 inches. Guard to be galvanized sheet steel not less than 26-gauge.

2.13 FIRE SAFING

- A. Metal piping and sleeves passing through floors, roof, partitions and fire walls, shall be provided with firestop by packing space between pipe and sleeve with UL listed non-sag and self-leveling fire safing insulation per manufacturer's instructions.
- B. Plastic piping passing through fire rated floors and fire rated walls shall be provided with firestop by providing intumescent wrap strip around the pipe, enclosed in steel collar attached to structure.

- C. Cracks, Voids, or Holes Up to 4" Diameter: Use non-sag or self-leveling putty or caulking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat, UL listed.
- D. Openings 4" or Greater: Use sealing system capable of passing 3-hour fire test in accordance with ASTM E814, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350oF (121 to 177oC), UL listed.
- E. Seal all holes or voids made by penetrations to ensure an effective barrier against smoke, fire, toxic and combustible gases.
- F. Unless protected, from possible loading or traffic, install firestopping materials in floors having void openings or four (4) inches or more to support the same floor load requirements.
- G. Manufacturer: Subject to compliance with requirements, provide non-sag and self-leveling fire barrier caulk, wrap/strip, moldable putty and sheet forms of one of the following:
 - 1. 3M Brand.
 - 2. Flame Stop.
 - 3. Dow Corning.
 - 4. Metacaulk.
 - 5. Engineer pre-approved equivalent

2.14 MECHANICAL SLEEVE SEALS

- A. Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
- B. Manufacturer: Thunderline or Engineer pre-approved equivalent.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install pipe for mechanical systems as shown on the Drawings, as called for in other Sections, and as specified herein.
- B. Arrange and install piping approximately as indicated, straight, plumb, and as direct as possible, form right angles on parallel lines with building walls. Keep pipes close to walls, partitions, and ceilings, offsetting only where necessary to follow walls and avoid interference with other mechanical items. Locate groups of pipes parallel to each other; space at a distance to permit applying full insulation and to permit access for servicing valves. Piping to be run in concealed locations unless indicated exposed, or in equipment rooms.
- C. Install horizontal piping as high as possible without sags or humps so that proper grades can be maintained for drainage. Branch piping shall come off the tops of mains unless shown otherwise.
- D. Contractor is responsible for providing intermediate structural steel as needed to allow for proper support of piping.
- E. Locate valves within reachable distance from equipment being served for easy access and operation. Do not locate valves with stems below horizontal.
- F. Check piping for interference with other trades; avoid placing water pipes over electrical equipment.
- G. Where rough-ins are required for equipment furnished by others, verify exact rough-in dimensions with Owner or equipment supplier before roughing-in.

- H. Install automatic temperature control valves, separable wells, humidifiers, pressure taps, and other items as called for and furnished by the temperature controls section.
- I. Install expansion tank as indicated on the drawings and in accordance with manufacturer's instruction. Vent and purge air from hydronic system, charge tank with proper air charge as recommended by manufacturer. Route drain to floor drain. Set floor mounted tanks on concrete housekeeping pads.
- J. Install air separators in pump suction lines. Connect inlet and outlet piping. Run piping to expansion tank with 1/4" per foot (2%) upward slope toward tank. Install drain valve. Separator shall not be supported by piping; install pipe hanger at inlet and outlet.
- K. Install manual air vents for each element of radiation coils at all high points in mains, branches, run outs and at other points likely to entrap air.
- L. Install automatic air vents in equipment rooms, at points where supply and return lines rise or drop. Extend 1/4" copper overflow line to glycol feeder tank.
- M. Install calibrated balance valves with flow meter fittings at each terminal unit and elsewhere as indicated.
- N. Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow-down connection. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow-down connection.
- O. Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment:
 - 1. Temperature control valves.
 - 2. Pumps.
- P. Install flow Venturis in piping as indicated on the drawings. Make all piping connections between Venturi and remote meter location.
- Q. Install control valves, flow switches, temperature sensor walls, gauge taps, flow meters, etc., provided by Temperature Controls Installer.

3.2 PIPING TESTS ALL GEOTHERMAL SYSTEMS PIPING

- A. Test pressure piping in accordance with ANSI B31.
- B. General: Provide temporary equipment for testing, including pump and gauges. Test piping system before insulation is installed whenever feasible, and remove control devices before testing. Test each natural section of each piping system independently, but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water or air and pressurize for the indicated pressure and time.
 - 1. Required test period is 2 hours.
 - 2. Test each piping system at 150% of operating pressure indicated, but not less than 100 psi test pressure.
 - 3. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.
- C. Repair piping systems sections that fail the required piping test, by disassembly and reinstallation, using new materials to the extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
- D. Drain test water from piping systems after testing and repair work has been completed.

- E. Pipes are to be thoroughly flushed and cleaned prior to being put into service. The flushing water must not go through any air handler, chiller, boiler, cooling or heating coils, terminal heating coils, or unit heaters. Strainer screens are to be removed prior to the flushing operation and are to be replaced when the flushing operation has been completed.
 - 1. As soon as possible after the flushing has been completed, the lines are to be filled with treated water to avoid the creation of a corrosive environment inside the pipes.
 - 2. Flushing operations are to be reviewed with and approved by the Owner's representative prior to any flushing operation. Pipe scale, welding slag, and any other debris shall be removed from pipes. The Owner's representative shall determine when the flushing operation is complete.

3.3 SLEEVES

- A. Install sleeves for piping passing through floors, roof, walls, concrete beams, and foundations.
- B. Install fire-proofing per manufacturer's written instructions.

3.4 ESCUTCHEONS

- A. Install escutcheons for pipes entering finished spaces.

3.5 MECHANICAL SLEEVE SEAL INSTALLATION

- A. Install mechanical sleeve seals at all pipe penetrations through foundations below grade.
- B. Loosely assemble rubber links around pipe and bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.

3.6 PIPE PENETRATIONS

- A. Penetrations shall be free of debris and dirt. Dam the penetration (when required) with an acceptable material. Apply firestop material to the penetration per manufacturer's installation instructions. Use a caulking gun, putty knife or other normal trade tools. Remove damming materials where necessary after cure. Clean up with Xylene.

3.7 FIRE SAFING

- A. Install fire safing at all penetrations through walls, floors, etc. per manufacturer's installation instructions as required to meet UL listing.

END OF SECTION

SECTION 23 2123
HYDRONIC PUMPS

GENERAL

1.1 SECTION INCLUDES

- A. Provide materials, equipment, labor and supervision necessary to install pumps as required by the Drawings and this Section.

1.2 QUALIFICATIONS

- A. Centrifugal pumps shall be by Bell & Gossett, Armstrong, Grundfos, PACO, Patterson, TACO or Engineer pre-approved equivalent. Model numbers and electrical characteristics as scheduled on Drawings.

1.3 PERFORMANCE AND TEST

- A. Pump capacities and ratings shall be as scheduled on Drawings.
- B. Pump performance and motor characteristics shall be such that motor will not be loaded beyond its service factor if operating head is reduced to 40% of specified head.
- C. Pumps shall be factory-tested at specified conditions.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's pump specifications, installation and start-up instructions, and current accurate pump characteristic performance curves with selection points clearly indicated.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.
- C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to HVAC pumps. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- D. Verify motor starter and VFD requirements with electrical drawings.

PART 2 PRODUCTS

2.1 IN-LINE CIRCULATING PUMPS

- A. In-line circulating pumps shall be single stage, vertical split case design, in cast-iron bronze fitted construction. The pump internals shall be capable of being serviced without disturbing piping connections.
- B. The impeller shall be of the enclosed type, hydraulically and dynamically balanced and keyed to the shaft and secured with a suitable lock nut.
- C. The pump shall employ a mechanical seal, with a carbon seal ring and ceramic seat. A shaft sleeve shall be furnished under the complete wetted area of the mechanical seal.
- D. The bearing frame assembly of the pump shall be fitted with oil-lubricated, bronze journal bearings and a hardened alloy steel shaft.
- E. A flexible coupling capable of absorbing torsional vibrations shall be employed between the pump and motor.
- F. The motor shall be resilient mounted, equipped with oil-lubricated journal bearings. Motors shall be ODP.
- G. Provide pump with ductile iron support stand for floor mounting.

2.2 FINISH

- A. Pumps shall be thoroughly cleaned and painted with machine enamel prior to shipment.
- B. Finish marred during installation shall be touched up.

PART 3 EXECUTION

3.1 PREPARATION

- A. Lay out exact location for concrete pump bases, and furnish to General Contractor a dimensional drawing showing base sizes and locations.
- B. In-line pumps shall be mounted in accordance with the pump manufacturer's recommendations. Layout piping system to accommodate motor removal requirements.

3.2 INSTALLATION

- A. Install pumps for all fluid systems as required by the Drawings.
- B. Provide the following for each centrifugal pump:
 - 1. Flexible connector in suction and discharge line.
 - 2. Strainer and shutoff valve in suction line.
 - 3. Check valve, flow indicator, and shutoff valve in discharge lines.
 - 4. Pressure gauges with snubbers and turn cocks in both pump suction and discharge.
 - 5. P/T ports in both pump suction and discharge.
- C. In-line pumps shall be supported in accordance with the pump manufacturer's instructions.

3.3 START-UP ASSISTANCE

- A. The manufacturer shall provide start-up assistance in the form of a factory trained service technician.

END OF SECTION

SECTION 23 2500.33
GEOHERMAL HEAT TRANSFER FLUIDS

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Glycol solutions.
 - 2. Pre-cleaner for glycol-related piping system.
 - 3. Automatic glycol feed systems.

1.2 SUBMITTALS

- A. Product Data for the following:
 - 1. Each glycol solution ratio.
 - 2. Glycol manufacturer's recommended pre-cleaner.
 - 3. Automatic glycol feed system
- B. Glycol manufacturer's shipping manifest, identifying each product, respective volume and on-site delivery date.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Glycol: Subject to compliance with requirements, provide products by one of the following:
 - 1. Dow Chemical Company
 - 2. Interstate Chemical Company
 - 3. Rhomar Water
 - 4. Engineer pre-approved equivalent
- B. Auto glycol feed: Subject to compliance with requirements, provide products by one of the following:
 - 1. J.L Wingert Co.
 - 2. Neptune Chemical Pump Co.
 - 3. Bell & Gossett
 - 4. Armstrong
 - 5. John Wood
 - 6. General Treatment Products
 - 7. Engineer pre-approved equivalent

2.2 GLYCOL SOLUTIONS

- A. Freeze protection for geothermal and heating hot water pipe systems shall be accomplished using the following glycol-based heat transfer fluids as indicated on plans.
 - 1. Fluids for propylene glycol (PG) systems requiring USP food-grade PG with corrosion inhibitors shall be Dow's DOWFROST, Interstate's Intercool P-323, equivalent by Rhomar Water or Engineer pre-approved equivalent.

- B. All glycol solutions shall be provided by a single manufacturer.
- C. Glycol solutions shall be ratio by volume and shall be premixed and prediluted by glycol manufacturer prior to manufacturer's shipment to site. Glycol concentrate shall not be mixed or diluted on-site in lieu of requirements identified herein.
- D. The water-to-air heat pump system shall have a 30% USP food-grade propylene glycol solution by volume, with freeze protection to 9°F and burst protection to -12°F.
- E. The glycol manufacturer shall analyze the fluid bi-annually to ensure the glycol solution continues to provide corrosion protection within industry standard; required testing shall be conducted at no additional cost to the owner.

2.3 AUTOMATIC GLYCOL FEED SYSTEMS

- A. Large automatic glycol feed systems (50 gallons or larger) as indicated on plans, shall consist of the following:
 - 1. Fifty (50) gallon minimum capacity polyethylene tank with hinged cover. Tank shall be translucent and manufactured to include a graduated-volume scale; scale shall be raised and painted a contrasting color.
 - 2. Painted carbon steel stand bolted to concrete equipment pad.
 - 3. NEMA 4X control panel, 115V, 8'-0" power cord, HOA selector for pump motor, 2-position main power switch.
 - 4. Bronze rotary gear pump capable of pumping required glycol solution ratios at 3.0 gpm at 100 psi.
 - 5. System shall include: piping as required to complete installation, check valve, pressure gauge, adjustable pressure switch, strainer, isolation ball valves, relief valve with return line to tank, pump isolation and float switch for low-level pump shutoff.
 - 6. Provide pressure sensor for each closed system and subsystem (a single unit could provide makeup for more than one piping system), to alert the building management system upon activation of any automatic feed system or subsystem.

PART 3 EXECUTION

3.1 SYSTEM FILL AND SOLUTION ADJUSTMENTS

- A. Auto feed systems are intended for incidental system makeup only, and as such, shall not be used for system fill of any kind or adjustment of glycol ratio.
- B. Refer to section 23 2113 Hydronic Piping for system test pressure and duration.
- C. During the flushing and cleaning of the system, the variable speed drive for one of the system pumps shall be operated in Hand at a constant speed of 60 Hz (maximum).

3.2 INITIAL FILL-FLUSHING

- A. The mechanical contractor shall meter the initial water fill for flushing of each system, for the purpose of hydrostatic pressure testing and/or system flushing; record the measured volume of the initial fill. The discharge resulting from draining the initial system fill shall also be metered and recorded, to provide a precise measure of system net volume, which yields the amount of water trapped in the system. This process will provide the basis for any required recommended adjustments by the glycol manufacturers to the premixed, pre-diluted glycol solution(s) prior to shipment and/or delivery (adjustment of the premixed glycol solution may be necessary to ensure the final solution strength is in compliance with the specifications).

3.3 SYSTEM CLEANING-CHEMICAL

- A. The system cleaner(s) shall be as recommended by the glycol manufacturer, including instructions identifying quantities of cleaner to use, method, duration and repetition of the cleaning operation(s); the glycol manufacturer may option to analyze the discharge of the final clear-water rinse, in order to determine satisfactory cleanliness, prior to the introduction and final fill of glycol. Monitor the system's pH for final indication of acceptable system cleanliness.
- B. Once the initial flush is complete and system drained, refill the system with clean water and provide the volume percentage of pre-cleaner for the removal of scale, oils and other extraneous materials as recommended by the glycol manufacturer. *NOTE: Bypass each mechanical coil prior to circulation to prevent circulation through any/each coil.*
- C. Drain the system after the required circulation period as quickly as possible to prevent settling of foulants. Run circulating pumps and flush with clean water until the discharge water is clear, and satisfactory to the glycol manufacturer. Expended pre-cleaner solution shall be disposed of in compliance with local, state and federal requirements.
- D. When system flush water is clear and satisfactory to the glycol manufacturer, remove and clean, and replace all strainers.

3.4 ANTIFREEZE SOLUTION-FINAL FILL

- A. The entire piping system, interior and exterior, shall be completely voided of clean water remaining after satisfactorily completed system cleaning to eliminate the possibility of any contamination. Once glycol is installed, if typical testing identifies any contaminants (total dissolved solids, bacteria, etc.) exceed maximum thresholds as determined by the glycol manufacturers recommendations, the contractor shall evacuate the entire system and refill with fresh, uncontaminated glycol.
- B. Install systems as indicated in the Specifications and as recommended by the manufacturer.
- C. Clearly label the direction of flow and the closed/open position of the isolation valves.
- D. Provide training to the owner's representative for testing and adding chemical to the closed loop system.
- E. Should the glycol-volume ratio of the initial fill not meet the minimum glycol ratio requirements, additional concentrate (100% glycol by volume) shall be introduced to the system(s) until the minimum ratio(s) is attained. Any glycol solution removed from the system to create adequate volume for the introduction of concentrate, shall be disposed of in compliance with local, state and federal requirements.
- F. Upon completion of glycol fill and necessary adjustments, the glycol manufacturer's confirmation of satisfactory ratios as installed, submit a completed "Glycol Fill Report" using formatted document at the end of this Section. The owner's representative and the contractor shall sign a statement that the concentration test was witnessed and that the antifreeze level of the system is at the specified freeze temperatures.
- G. Provide MSDS sheets at each glycol auto feed unit for respective fluids. MSDS sheets shall be laminated and secured to adjacent wall in a permanent Plexiglass frame.
- H. Provide a new, clean, polyethylene barrel (size at owner's discretion but maximum fifty five gallon) at each systems' pressure relief valve related to each auto feed unit. Provide relief piping from relief valve to indirect discharge into barrel. Barrels shall be consistent, and either provided by the glycol manufacturer or as appropriate for glycol usage. Include all caps to allow water-tight seal.

3.5 FIELD QUALITY CONTROL

- A. After each closed loop system has circulated glycol solution for a period of 30 days, submit to the glycol manufacturer a glycol sample from each system, in labeled containers provided by the manufacturer. Both the contractor and the owner shall be named on each sample, to ensure both receive a copy of the analytical results directly from the manufacturer.

- B. If the glycol manufacturer's review of the sample analysis indicates inhibitor (or other) adjustment is necessary, glycol and inhibitor concentrations shall be completed per manufacturers recommendations. Repeat sample at one month intervals until analysis returned requires no further action taken.

END OF SECTION

SECTION 23 8144
HORIZONTAL GROUND SOURCE HEAT EXCHANGER

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Contract drawings, specifications and general provisions of the Contract including General and Supplementary conditions, apply to this Section.
- B. Ground Source Heat Exchanger Inspection and Test Report (Section 23 8144.B); Bore Record (Section 23 8144.C); Loop Field Material Count Sheet (Section 23 8144.D).
- C. Site and Utility plans.

1.2 SECTION INCLUDES

- A. Provide equipment, materials, labor and supervision necessary to install the horizontal, directionally bored loops, piping and header distribution system described within the contract documents, and other work as required for the heat exchanger system.
- B. References herein to oversight by the general contractor or prime contractor, is intended to signify the primary contractor directly obligated to the owner by contract.
- C. NOTE: Work of this Section shall be directly completed by the permanent employees of the geothermal loop field contractor. In the event this contractor's own forces cannot complete the work of this Section in entirety, then no more than a maximum combined total of 40% the value of the work of this Section may be subcontracted to an outside entity or entities.

1.3 STANDARDS AND CODES

- A. International Ground Source Heat Pump Association (IGSHPA) Installation Standard for Closed Loop Geothermal Heat Pump Systems.
- B. Plastic Pipe Institute®: Handbook of Polyethylene Pipe, Polyethylene Joining Procedures and Polyethylene Pipe for Horizontal Directional Drilling
- C. CPChem Performance Pipe Heat Fusion Joining Procedures and Qualification Guide
- D. State & Local Health Department Ordinances
- E. Iowa Administrative Code and Iowa Department of Natural Resources

1.4 SUBMITTALS

- A. General:
 - 1. Submit the following in accordance with the Conditions of Contract and Division 1 Specification Sections.
 - a. Evidence of completion of a certified installation training program offered by the International Ground Source Heat Pump Association (IGSHPA).
 - b. Evidence that a certified heat fusion technician has attended retaining school within the past twelve months.
 - c. Current State of Iowa Water Well driller certification.
- B. Product data for high density polyethylene piping (HDPE) and grout.
 - 1. Submit product data identifying each typical component to be used within heat exchanger piping system. All polyethylene piping shall be products of a single manufacturer. Submit

HDPE manufacturer's specific pressure testing procedures, including test pressures and time durations.

2. Submit product data for all grout products, silica sand, drilling mud and polymers; identify intended borehole diameter and include calculation for volume of grouting mix (bags of thermally enhanced grout, grout manufacturer recommended silica sand (bags or bulk weight and water) required per borehole. All grouting and drilling products shall be NSF 60 compliant.
 3. Dimensioned loop field header plans.
- C. Marking tape.
1. Submit samples of marking tape with complete printed label to be used.
- D. Project record documents to record the following:
1. GPS surveyed location of the major corners of the loop field; coordinate with engineer for actual number and locations.
 2. Dimensioned drawing showing routing of pipes, marking devices and trench limits.
 3. Drawing showing identification number for each loop referenced to the dimensional drawing.
- E. Written Statement of Intention to use DCI Eclipse & Digitrak equipment as specified herein.
- F. Written warranty statement as outlined in 1.6 Warranty below.
- G. Drillers Qualifications: Submit copy of current State of Iowa certification as water well driller.
- H. Submit copies of current certifications – initial training and retraining as applicable - for all fusion technicians that will be conducting or overseeing fusion processes onsite.

1.5 QUALITY ASSURANCE

- A. Construct bores in accordance with Iowa Rules and Regulations governing horizontal loop installation, including submittal of permits and fees.
- B. Loop Installer Qualifications:
1. Loop installers must have completed a certified training program offered by the International Ground Source Heat Pump Association (IGSHPA), IGSHPA approved manufacturer's certification program for fusion installations or a DOT certified heat fusion technician.
 2. Certified technicians must attend a retraining school every two years and submit copies of current certifications for all fusion technicians onsite.

1.6 WARRANTY

- A. Special Product Warranty: Submit a written warranty, agreeing to repair or replace pipe that fails in materials or workmanship within the specified warranty period. Failures include, but are not limited to, pipe and fittings. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.
1. Warranty period is five years after date of Substantial Completion of the project, as determined by the owner.

PART 2 PRODUCTS

2.1 MATERIALS AND PRODUCTS

- A. General: Provide factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings and capacities as indicated; all polyethylene components shall be commercial products of a single manufacturer. Installer shall provide all materials.

2.2 POLYETHYLENE PIPE SYSTEMS

- A. All piping exterior to building shall be HDPE, SDR specific as identified in plans and specifications.
- B. Pipe shall be manufactured in accordance to ASTM D-3035-93 (IPS-OD, SDR-11, 160 psig at 73.4 degrees F) for applicable sizes or shall be manufactured in accordance to ASTM D-2447 (IPS-OD, SDR 15.5) for sizes 3 inches and larger. U-bend loops for borehole installation shall only be as commercially manufactured, factory fabricated with materials consistent with HDPE definitions herein; field fabricated loops are not acceptable.
- C. All pipe shall be manufactured from virgin PE3408 (high density polyethylene) with minimum cell classification PE345464C per ASTM D 3350 "Standard Specification for Polyethylene Plastic Pipe and Fittings Materials". Piping shall experience zero (alternate) failures after 5,000 hours under condition "C" (100% reagent at 100 C) when tested in accordance with ASTM D 1693, "Standard Test Methods for Environmental Stress-Cracking of Ethylene Plastics".
- D. Pipe shall be permanently marked the full length. The markings information shall include the manufacturers name, nominal size, pressure rating, ASTM specifications, standard dimension ratio or schedule number, material type, cell classification and date code.
- E. Fittings shall be specified as ASTM D-2683 for socket joints and ASTM D-3261 for butt joints, and shall be of the same PE classification as the connecting pipe.
- F. All HDPE submitted for use shall be of a single manufacturer and shall be CPCChem Performance Pipe Driscoplex 5300 or equal by Centennial Plastics.

2.3 GROUT

- A. Thermally Enhanced Bentonite Grout: The bentonite grout (compound of bentonite and high-grade silica sand) used to seal and backfill the vertical U-pipe heat exchanger in the borehole shall be NSF 60 compliant and have a minimum manufacturer's recommended mixture of 60% solids. The grout shall have a permeability rate of less than 8×10^{-8} cm/s (and meet state regulations) and a minimum thermal conductivity of 0.88Btu/hr-ft-deg F. Grout shall be ASTM 5084 and 5334 compliant as tested by an independent lab; manufacturer shall provide such documentation upon request.
- B. Grout shall be a Black Hills Bentonite thermal grout product as developed and distributed by GeoPro or Baroid Barotherm or Engineer pre-approved equal; silica sand shall only be as approved by grout-manufacturer. Manufacturer shall provide free of charge, periodic testing of grout samples as retrieved and submitted by the engineer, frequency of which to be determined by the engineer.
- C. The contractor shall submit dated shipping receipts identifying volumes/bags/weights of grout and sand delivered to this project site. Materials offloaded on this site shall be specific to this project only and shall remain on this site. This project site shall not be used as a shipping-stop for materials to be forwarded to other projects or sites unrelated to this project.

2.4 MARKING TAPE & TRACING WIRE

- A. Marking tape: Shall be manufactured of material that is highly resistant to alkalis, acids and their destructive agents found in the soil. The tape shall be three-inches wide, with a continuous message printed every sixteen to thirty-six inches and installed within 18" of grade.
- B. Tracing wire: Shall be 10 gage insulated solid copper, installed within 6" of top of pipe.

2.5 HEAT FUSION

- A. Requirements for initial heat fusion training-certification, and retraining every two years, shall be as identified in this Section.
- B. All HDPE joints shall be by heat fusion. Butt fusion and/or socket fusion are the only acceptable means of heat fusion for field joints; saddle-joints may be used for manufactured headers only, only after approved through shop drawings, and are not an acceptable means for field joints.

1. 'Manufactured headers' shall be defined as the loop field header system used to join the individual U-bend loops to the field distribution piping. This assembly(s) shall be factory fabricated in a manufacturing facility whose primary function is the fabrication of similar assemblies; field fabricated headers or those fabricated in or by the contractor's own shop or facility(s) are not acceptable.
- C. Joining shall be either by the butt or socket heat fusion method in accordance with the polyethylene piping manufacturer's Heat Qualification Guide, IGSHPA and as specified within ASTM D-2683 for socket joints and ASTM D-2610 for butt joints.
- D. Heat fusion shall not be conducted in cold environments where temperatures or wind chill of 40°F or colder is experienced. The only exception to this temperature limit requires all of the following be satisfied – **any fusions completed during a lapse in any one or more of these conditions will void the associated fusions.**
 1. The contractor will provide and maintain a heated, rigid-framed tent to prevent any wind from blowing through the enclosure and piping trench. Temperature inside the tented area shall be maintained at 40°F or higher. If this minimum temperature is not consistently achieved, the general contractor (or prime contractor) shall correct the deficiency or stop work until warmer outside temperatures are established.
 2. The tent shall be of sufficient size to completely cover the area in which fusion jointing is to occur, plus an additional fifteen feet each side for a total minimum enclosed length of at least forty feet (15' + 10' jointing space + 15').
 3. Piping and materials to be fused shall be pre-warmed. At a minimum, piping lengths in 2. Above shall pre-warmed to at least the minimum inside-tent temperature of 40°F; once pre-warmed, this minimum temperature shall be maintained for associated piping and materials.

2.6 EXTERIOR VAULT

- A. Manufactured vault, either concrete or HDPE, as specified on plans.
 1. Basis of design is Ground Energy Manufacturing, or approved equivalent by ISCO Industries or Uponor/KWH or Engineer pre-approved equal.
 2. Vault shall be pre-manufactured composite structure of welded steel and concrete. The inner shell shall consist of a minimum of 1/8" plate steel walls and ceiling and 3/16" steel floor. The access manhole inner shell wall and lid shall be constructed of 1/4" steel. #5 rebar reinforcing shall be spaced at 18" on center between the inner steel wall and the outer steel form wall to form an 8" cavity to accept poured concrete. 4000 psi concrete pour for the vault lid and walls is the responsibility of the installing contractor.
 3. Manifolds: Vault shall contain polyethylene supply and return manifold, connecting respective field header pipes. Each manifold shall include 3" purge port.
 4. Internal connections to field headers:
 - a. Return to loop field: pipe shall include isolation valve
 - b. Supply from loop field: shall include Victaulic TA 788 balancing/isolation valve with memory stop.
 - c. PT ports on both supply and return.
 5. Vault shall contain an access manway with a neoprene gasketed bolt-on cover and an access ladder. Ladder shall conform to current OSHA standards. The first rung of the ladder shall not be less than 2" from the bottom of the manway and should extend to the floor of the vault.
 6. Vault shall include a service light located at the top of the vault with a light switch close to the man-way hatch and a GFCI electrical outlet for sump pump connection. Light fixture, conduit, junction box, outlet and switch will be installed by the vault manufacturer. Wiring of the switch, light fixture, and GFCI outlet is the responsibility of the installing contractor.

7. Sump basin shall be a 12" diameter, 2.75" deep basin of welded construction integral to the floor of the vault.
 8. Polyethylene pipe penetrations through the vault walls shall be sealed with "Link Seal" type mechanical seal penetration sleeves. Conduit and sump pump discharge pipes penetrations shall be welded penetrations.
 9. Vault manufacturer shall leak test welded shell prior to interior and exterior painting of the structure. Piping manifold shall be leak tested to 100 psi with water for no less than 3 hours with no leaks.
- B. Sump pump:
1. Grainger # 3YU54, Manufacturer: Dayton #3YU54 Submersible Pump or Engineer pre-approved equal. 1/6 HP-115-volt Sturdy composite glass filled polypropylene housing and base, Polyphenylene Oxide impeller, 1 1/4" NPT top discharge port. Motor shall be suitable for intermittent duty. Pump shall be capable of 11 GPM @ 10 feet of head. Maximum solid handling 1/8". Unit shall be supplied with a 10' power cord.
 2. Automatic float switch Grainger # 4RL50 or Engineer pre-approved equal, Manufacturer: Little Giant # RS-5LL Low level automatic switch with 18' power cord.
 3. Check valve: Grainger #2P843 or Engineer pre-approved equal, Manufacturer: Zoeller # 30129 Full flow PVC check valve with FNPT connection rated for 4.3 PSI at 130 degrees F. Includes stainless steel clamps, screws and hinges.
- C. Vault paint coating
1. Diamond Vogel Mult-e-poxy 180 cotton white and Mult-e-poxy 180 regular catalyst or Engineer pre-approved equal. Interior and exterior metal surfaces of the vault painted.
- D. Circuit Tags
1. Brass Valve Tags: Provide 19-gauge polished brass valve tags for all loop circuits with stamp-engraved piping system abbreviation (GEO) in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener.
 2. Provide 1-1/2" diameter tags, except as otherwise indicated.
 3. Fill tag engraved with black enamel.
 4. Valve Tag Fasteners: Manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to loop circuits and manufactured specifically for that purpose.
- E. Supply And Return Directional Banding Tape
1. Arrow Directional Banding Tape: Provide 4 mil Flexcon® Vinyl Film or Engineer pre-approved equal for all Supply and Return piping within the vault with 3" wide tape printed with 2-1/2" letters attached with permanent adhesive. Tape must have a service temperature range of - 40°F to 180°F.
 2. Provide 3" wide directional banding tape, except as otherwise indicated.
 3. Color shall be White Letters on Green Tape.
 4. Arrow shall indicate the direction of flow.
 5. Application temperature: 50°F or above.

2.7 SEEDING

- A. Seed shall contain a mixture of Kentucky Blue Grass, Merion Blue Grass and Creeping Red Fescue Grass.

B. Topsoil:

1. Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.
2. Excavated from site and free of weeds.

C. Accessories:

1. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.
2. Fertilizer: Recommended for grass, slow release nitrogen, biological materials, and biostimulant materials; of proportion necessary to eliminate deficiencies of topsoil.

PART 3 EXECUTION

3.1 INSPECTION

A. General

1. Examine areas and conditions under which the ground source heat exchanger system is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
2. Examine geotechnical data and report, and other data as presented in the contract documents for statement and observations which may impact installation of the loopfield as shown on plans.
3. Formation Log - Horizontal Test Bore: (location identified on plans)

FORMATION LOG		
Vertical Distance (feet)		Description (List type of soil)
From	To	
0	25	Brown clay
25	45	Blue-gray clay

Note: Test bore was placed at - 30' from original grade (see original topography on civil site plans), which may differ from finished grade as defined under this project.

4. Consider minimum horizontal and vertical clearance requirements when determining the boring alignment(s), including road and property setbacks and easements, and existing surface and subsurface features.
5. The contractor shall fully examine this site's conditions through investigation of known and/or reported subterranean geologic, water table, and other conditions, which may adversely affect drilling/boring at this site, including water well records. Resources available for review include but not limited to, the Iowa Geologic Survey Bureau, Iowa Department of Natural Resources, State water well records, County and City records and local drillers.

3.2 HORIZONTAL DIRECTIONAL DRILLING/BORING

A. General:

1. Contractor shall be responsible for all water required onsite, including but not limited to: drilling, grouting, wash down, etc. All field equipment expected to be in contact with subgrade geology (i.e., drill heads, rods, casing, tremie pipe, etc.) shall be cleaned and free from contamination (i.e., iron bacteria, etc.) prior to delivery to site.
2. All piping depths shall be related to local grade associated with the boring activity. If finished grade of the site is to be less than initial grades, then accommodate finished grade in actual

depths of installed piping. If finished grade increases initial grades, install piping relative initial grades unless conflict will arise with other site work; notify the Engineer in writing prior to start of installation of any such conflict.

3. Loop lengths and depths of boring/loop installation shall be as identified on plans.

B. PRE-INSTALLATION:

1. Contact Iowa One Call to identify all public utilities; ensure the owner has identified all private utilities.
2. Walk the site to identify potential hazards, interferences, and special considerations; utilize the locator to determine areas of electrical interference.
3. Establish construction staking/markings to indicate entry/exit locations and proposed alignment at 50' intervals.
4. Pre-installation meeting is required to review oversight of loop field installation; boring, reaming and grouting procedures; confirm bore-hole grout calculation; bore log and material count sheet; data acquisition, satisfactory data quality, format of data submittals; other related topics as necessary.

C. Drill head locator shall be utilized for each bore per the following:

1. DCI Digitrak® Eclipse® dual frequency hand-held locator, coupled with an Eclipse series transmitter either EXL Long Range (85' depth range) or EDF Dual Frequency (60' depth range) or Engineer pre-approved equal. Previous generation equipment (i.e., Mark V) is not acceptable.
2. Calibrate the receiver with transmitter prior to the start of the project, and at specified intervals recommended by the manufacturer.
3. Record all real-time boring (pitch and depth) and pullback data using DCI Digitrak® DataLog® through the Eclipse receiver, to also enable the download, analysis and archiving of data, resulting in a complete portfolio of output data for each bore. English with English units shall be utilized. Previous generation equipment (i.e., Mark V) even with data recording capability is not acceptable. Data shall be recorded and exported in English, with units of feet and inches.
4. Provide Engineer with a copy of the Eclipse DataLog software the contractor intends to use, identical in version and including all manufacturer-released updates.
5. Start with a sample at the zero-elevation reference, then sample each bore at regular intervals, at least once per 10' or 15' drill rod. Save each run as an independent, consecutive run number to coincide with the horizontal loop number.
6. Download the DataLog® data files (.dld and .oc2) from the receiver each week or every twenty five bores, whichever comes first.
 - a. Download to computer shall be made using DCI's USB-IR (infrared) data cable.
 - b. Each file shall be downloaded twice (second download is a backup) and saved to different data files, independently named on the computer hard drive, thereby ensuring against a corrupted data file.
 - c. Filenames shall utilize the date of download in the following MMDDYY format: "062109-1.dld and "062109-1.oc2; the backup files would be named: "062109-2.dld" and 062109-2.oc2".
 - d. If downloaded data requires editing by the contractor: first, notify the Engineer of the circumstances; second, provide copies of the original unedited data files (as downloaded from the receiver) shall be forwarded with the edited files.

- e. Submit each week, the full complement of formatted data output (profile and drill data) associated with the respective week's bores including electronic data files.
 7. Translating downloaded data within DataLog computer software.
 - a. Input all project information in the Run Information window and run-specific data in Drill Information window.
 - b. Ensure the DATA Field is completely utilized – Distance, Pitch, Depth, iDepth, Relative Elevation and Type. Provide Comments in the respective field as necessary to notate run-specific information.
 - c. Input run-specific information in the Rod Length Data Input Fields.
 - d. Include utility flags for all utilities crossing any perimeter of the bore field.
 8. PRIOR TO DELETING DATA FROM THE RECEIVER, print and preview the project reports to ensure the data represented is accurate and the output of the printed reports is satisfactory.
 9. To ensure the recording, downloading and output procedures are functioning correctly, after the first day of boring on this project download the recorded data and generate all outputs available. Review with the Engineer prior to continuing boring.
 10. If at any point of any boring sequence the data collection system fails, the contractor shall complete that particular bore including loop insertion and grouting and contact both the general contractor (or prime contractor) and the engineer. Boring shall not proceed until the defective equipment is replaced and shown to be in satisfactory operation; both the engineer and general contractor (or prime contractor) shall witness satisfactory operation of the replacement equipment prior to continuing.
- D. Boring, reaming/loop pullback:
1. Bore full length either 4" or 5" diameter shall constitute the first pass; recognize a 5"Ø bore will require considerably more grout/silica to fill the annulus than a 4"Ø (>60% more if using 1"Ø loops and >65% more if using 1-1/4"Ø loops). Utilize drilling mud, polymers, etc. as necessary to ensure bored hole remains open for back ream and loop insertion.
 2. A back reamer coupled with a swivel to the HDPE loop and tremie, pulled back shall constitute the second pass. The back reamer is intended to ensure the finished bore stays open for sufficient duration to receive the calculated volume of pumped grout/silica mixture; the swivel ensures isolation between the HDPE loop and the rotating drill stem.
 3. Visible portions of installed pipe exhibiting gouges, cuts or abrasions may be subject to abandonment and replacement at the engineer's discretion, as will pipe exhibiting stretching, distorted or out-of-round shape.
- E. Grouting:
1. Calculate grout volume to fill borehole and witness pumped placement of calculated volume thereby ensuring the borehole is completely grouted. Complete and date a bore log for each loop bored (Bore Record 23 8144C attached).
 2. Complete grouting of each U-tube loop shall be accomplished using continuous placement of thermally enhanced grout through a 1" minimum (i.d.) tremie pipe. The grouting process shall conform to the grout manufacturer's instructions and "Grouting for Vertical Geothermal Heat Pump Systems – Engineering Design and Field Procedures Manual", latest edition as published by the International Ground Source Heat Pump Association (IGSHPA). The grout installer shall monitor each borehole and continue adding grout as required, up to two (2) hours. The mixed grout-sand compound will be randomly tested by the engineer.
 3. Ensure both ends of each bore hole are grouted to provide a seal to prevent surface water from migrating below the surface.

3.3 TRENCHING AND BACKFILLING

- A. Loop field headers and field distribution piping shall be buried at a minimum of 60 inches deep. A four inch bed of sand shall be used for all horizontal piping, covered with eight inches of sand. No rock, wood or organic materials shall be present. Backfill shall be completed only after the piping has been installed, tested, flushed, purged, inspected and approved while still under pressure. Remaining backfill shall be completed using original clean fill from trench excavation; excavated asphalt and concrete shall not be used as backfill. Coordinate the lying of the horizontal piping with the mechanical and electrical utilities. Prepare dimensioned drawing of the proposed closed loop ground heat exchanger piping system before backfilling. Placement of the U-tube and full grouting shall be completed immediately after each loop is pulled back.
- B. Do not backfill trenches until all required inspections are made and tests performed with satisfactory results. Before backfilling the entire piping system shall be pressurized and inspected by the engineer. Provide the engineer 72-hour notice for inspection. All work covered prior to engineers inspection will be uncovered by contractor at contractors expense.
- C. Label each loop inside the building by header number as indicated on plans, including associated gpm's (identify per 23 0553/Valve Tags) and indicate labels on location plan.

3.4 MARKING TAPE & TRACING WIRE

- A. Install marking tape above all horizontal/header piping, twelve inches below grade.
- B. Install tracing wire six inches above all exterior horizontal piping (piping installed at -5'-0" from grade minimum).
- C. Wire shall be 10 gage coated/insulated copper and shall be installed continuously with backfill, taped to top side of pipe in 5 foot intervals.
- D. Single piece of continuous wire shall be looped from vault or building, to manufactured header and back to vault or building. Tails shall be routed directly into the field vault or mechanical room, and tails shall be permanently marked to identify consistent with respective header pair.

3.5 INSTALLATION OF HDPE PIPING

- A. Install piping in accordance with manufacturer's instructions.
- B. Contractor shall only use factory fabricated heat exchanger with factory fused U-bend, ensuring only factory fabricated fusion joints are installed at depths below that of the header pit.
- C. Each loop shall be pressure tested prior to insertion into the borehole.
 - 1. Per HDPE manufacturer's recommendations.
 - 2. With water at 100 psi or 1.5 time system pressure whichever is greater, for 30 minutes with no observed leaks. Leaks shall be as indicated by pressure drop observed on the gauge, beyond the volume increase due to application of pressure (stretching) acceptable to the manufacturer.
- D. Once installed, each loop shall be visually flow-tested to prove loop is free of debris, kinks and blockages. If loop is not immediately connected to its respective horizontal manufactured header, temporary caps shall be installed pending final connections to header. Temporary caps shall be heat fused HDPE or mechanical cap (i.e. tapered plug with clamp) or engineer-approved equivalent; tape or non-mechanical/permanent means of capping is not acceptable.
- E. Join the pipe and fittings using either butt or socket fusion processes only - no other method is acceptable. Make vertical loop takeoff tee fittings using tees on header piping 1-1/4 inches and above. Use bell reductions at all pipe reductions to eliminate trapped air. Use reducing socket tees when fabricating socket type reducing headers. Allow joints to cool for three (3) hours before exposure to water and eight (8) hours before pressure testing.
- F. Avoid sharp bends in piping. Consult pipe manufacturer for minimum bend radius, but in no cases tighter than twenty-five pipe diameters. Install elbow fittings for bends which require tighter radius than manufacturer recommends.

G. Loop Field Piping:

1. Extend field distribution piping from the loop field headers to the manifold in either the field vault or mechanical room in building header, as shown on plans.
- H. Installation of all horizontal PE piping (distribution piping to/from vault or building, and manufactured loop field headers to each individual loop) shall include continuous tracing wire from commencement of header, to vault or mechanical room in building.

3.6 GROUTING

- A. Each bore hole shall be completely and continuously pressure grouted with 1" (minimum) tremie pipe the entire length of the bore; bore is defined as total distance the drill head is underground, and as such is greater than the nominal loop length (i.e., 410, 510, 610, etc.), and as identified above.
- B. The tremie pipe shall be kept full of grout continuously from start to finish of the grouting procedure, with the discharge end of the tremie pipe continuously submerged in the grout until the zone to be grouted is completely filled.
- C. Bore holes shall as a minimum, be grouted in compliance with State and local requirements, within the guidelines of the National Ground Water Association (NGWA) and recommendations of IGSHPA. Since settling of the grouting material may occur after the initial grouting, Contractor shall monitor each bore hole and continue adding grout as required.
- D. A Bore Record (Section 23 8144.C) shall be completed for each borehole drilled and grouted. Contractor shall provide sample calculation of required grout components – thermally enhanced grout, silica sand and water – required to fill borehole to depth, based on anticipated diameter of complete borehole. The date identified on the Bore Record will be utilized in part as the contractor's declaration of boring and grouting completed on the same day.
- E. Periodically, grout as prepared by the contractor onsite will be sampled and analyzed to ensure compliance with plans and manufacturer's recommendations. If results of the sample indicate the grout to be does not meet minimum qualifications identified on plans, the contractor shall provide at his own cost, additional bores, loops and interconnecting HDPE piping/headers required to provide a completed bore field of equivalent thermal capacity.

3.7 CLEANING AND TESTING

- A. Cleanliness: All HDPE piping (loops, headers, etc.) not immediately connected to the system, shall be temporarily capped by either heat fusion or mechanical cap (i.e. tapered plug with clamp) until permanently connections are made – tape or other insignificant means of capping shall not be acceptable.
- B. Flushing the Ground Heat Exchanger: Before connection of the ground heat exchanger loops are made to the horizontal loop field headers, each loop shall be flushed thoroughly, flow and pressure tested, and capped until it is connected to the header.
- C. Pressurizing: Each U-bend loop shall be water filled and pressure tested (per HDPE manufacturer's recommendations) prior to insertion into the borehole. Each complete header system shall be flow and pressure tested (per HDPE manufacturer's recommendations) prior to backfill of the trenches; HDPE piping shall ONLY be pressure tested with a water medium. Every weld shall be visually and physically examined. Notify Architect/Engineer four working days before test.

3.8 FLUSHING AND PURGING

- A. General: Before backfilling, the system shall be flushed and purged of air and flow tested to ensure all portions of the heat exchanger are properly flowing. A portable temporary purging unit may be used and shall consist of the following:
 1. Purge pump - high volume and high head.
 2. Open reservoir.
 3. Filter assembly with by-pass.

4. Flow meter.
 5. Pressure gauge.
 6. Connecting piping.
 7. Connecting hoses.
- B. Flush lines and appurtenances as required to remove all dirt and contaminants within the piping system with potable water until no dirty water appears at outlet.
- C. Purge air from system, or sections of system, by maintaining minimum of 2 feet per second for 15 minutes through each section or header. Purge until no air bubbles are observed leaving the system.
- D. Purging flow rates and pressure drops shall be compared to calculated values to assure there is no blockage or kinking of any pipe. A Ground Source Heat Exchanger Inspection and Test Report (Section 23 8144.B) shall be completed for each header system. Each header report shall be submitted to the engineer for review and final acceptance of testing procedures and results.
- E. Flush and purge each ground heat exchanger system using procedures recommended by IGSHPA until free of air, dirt and debris. Conduct the flushing and purging operation with the water source heat pump piping isolated with shutoff valves.

3.9 FIELD QUALITY CONTROL

- A. Prior to the start of boring and loop installation, a pre-installation meeting will be held to confirm processes and procedures expected onsite, by both the General Contractor (or prime contractor) and the geothermal loop field installer.
- B. Oversight of loop field installation
- C. Data Log data acquisition, satisfactory data quality, formatted data submittals.
- D. Bore logs.
- E. General contractor (or prime contractor) shall conduct a daily count of loops installed and volume of material used each. Attached log sheet (Section 23 8144D) shall be utilized and submitted weekly.
- F. Loop field Material Count Sheet
- G. GPS data record: Each borehole shall be GPS surveyed and recorded on each respective bore log, in addition to GPS shots of trench limits' back to the vault. Provide twelve additional GPS shots at building/site locations as reference to fix-in-place the loop field shots; locations to be coordinated with the Engineer. GPS shall conform to the following parameters: DGPS real time accuracy of <30 cm (centimeters) and multi-channel capable of providing accurate 3D position logging; all data output shall be in northing-easting coordinate system. On loop field record drawings, provide data in table form cross referenced with each borehole; include same data in O&M's.

3.10 REPORTS AND DATA ACQUISITION

- A. The following reports shall be submitted to the engineer:
1. Ground Heat Exchanger (GHX) Inspection and Test Report 23 8144.B.
 2. Bore Log 23 8144.C – Keep a record of all bores onsite for review and submit copies to support monthly payment request.
 3. Loop field Material Count Sheet 23 8144.D. Submit weekly.
 4. Data acquisition results – hard copy and electronic. Submit weekly.

3.11 SEEDING

- A. Do not seed areas in excess of that which can be mulched on same day.

- B. Do not sow immediately following rain, when ground is too dry, or during windy periods.
- C. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches (3 mm). Maintain clear of shrubs and trees.
- D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches (100 mm) of soil.
- E. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches (100 by 100 mm).
- F. Protection:
 - 1. Lay fabric smoothly on surface, bury top end of each section in 6 inch (150 mm) deep excavated topsoil trench. Provide 12 inch (300 mm) overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.
- G. Maintenance:
 - 1. Provide maintenance at no extra cost to Owner; Owner will pay for water.
 - 2. Provide maintenance of seeded areas for three months from Date of Substantial Completion.
 - 3. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.
 - 4. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches (65 mm). Do not cut more than 1/3 of grass blade at any one mowing.
 - 5. Neatly trim edges and hand clip where necessary.
 - 6. Immediately remove clippings after mowing and trimming.
 - 7. Water to prevent grass and soil from drying out.
 - 8. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
 - 9. Immediately reseed areas that show bare spots.

END OF SECTION

SECTION 23 8144B
GROUND SOURCE HEAT EXCHANGER (GHX) INSPECTION & TEST REPORT

Note: Use a separate form for each system.

Building: _____ Inspection Date: _____

Ground Heat Exchanger No. or Description: _____

List the WSHP Unit Nos. served by this GRX: _____

Ground Heat Exchanger Design Water Flow: _____ gal/min

Calculated purging flow and press to achieve 2 ft/sec:

Purging: Flow: gal/min Head: psi Duration: min.

Did the system pass the pressure test? ☐ yes ☐ no

How much did _____ -inch diameter reservoir level change with _____ ΔP ? _____ inches

Is antifreeze required in system? ☐ yes ☐ no If yes, was antifreeze measured? ☐ yes ☐ no

Has a dimensioned drawing been prepared, completely and accurately showing the layout of the GHX?
☐ yes ☐ no

Does the layout differ substantially from the contract documents? ☐ yes ☐ no

If so, is the deviation approved? ☐ yes ☐ no

Depth of installed horizontal/vertical loops is _____ ft. (Design is _____ ft.)

Depth of horizontal piping is _____ ft. (Design is _____ ft.)

Are the trenches clear of sharp bends, rocks, or other sharp objects that could restrict the flow? ☐ yes ☐ no

Are all the joints heat fused (butt or socket fusion)? ☐ yes ☐ no

Do all the joints have the proper amount of roll-out? ☐ yes ☐ no

Was the system backfilled properly with good, clean backfill materials? ☐ yes ☐ no

Comments:

Inspected and approved this _____ (date)

By: _____ Title: _____

SECTION 23 8144C

BORE RECORD

(record daily, submit weekly)

Date: _____

Bore Number (i.e."2C")..... _____

Bore Depth..... _____

Bore Diameter..... _____

Diameter of loop installed..... _____

Length of loop installed (per markings on loop)..... _____

Depth grouted to (below ground)..... _____

Number of sacks of grout installed..... _____

Weight of silica sand..... _____

Size of tremie pipe used..... _____

Depth		Drilling Log
From	To	Observed Conditions

END OF SECTION

[illegible]

END OF SECTION

SECTION 26 01 00
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Basic materials and methods.

1.2 REFERENCES

- A. Work shall comply with applicable standards of the:
1. American Insurance Association
 2. American Society for Testing and Materials (ASTM)
 3. Edison Electric Institute
 4. Factory Mutual (FM)
 5. Institute of Electrical and Electronics Engineers
 6. Insulated Power Cable Engineers Association
 7. National Board of Fire Underwriters
 8. National Bureau of Standards
 9. National Electrical Code (NEC)
 10. National Electrical Manufacturer's Association
 11. National Electrical Safety Code
 12. National Fire Protection Association
 13. National Safety Council
 14. Underwriters' Laboratories, Inc. (UL)
 15. Uniform Fire Code (UFC)
 16. William-Steiger Occupational Safety and Health Act of 1970 (OSHA)

1.3 SYSTEM DESCRIPTION

- A. Basic materials and methods are described.

1.4 SUBMITTALS

- A. Submit to the Architect/Engineer for review, prior to the placing of orders for any equipment, a complete schedule of electrical fixtures, materials, and panels to be installed. Schedule shall consist of catalog cuts, diagrams, shop drawings, performance curves, or any other descriptive material necessary to fully describe the equipment proposed and its operating characteristics.
- B. Review of the materials, including alternate or substitute items, shall be obtained in writing from the Architect/Engineer; verbal review will not be considered binding.
- C. Submittals shall have been reviewed and signed by the contractor, prior to submittal to the Architect/Engineer. Faxes or copies of faxes are not acceptable. The Architect/Engineer will review

submittals to aid in interpreting the drawings and specifications, and in so doing will assume that the submittals conform to the specified requirements set forth in this specification. Review of submittals by the Architect/Engineer does not relieve the Contractor of the responsibility of complying with the elements of the specifications.

- D. Furnish copies of parts lists and operating and maintenance instructions and manuals, and furnish the services of a competent, trained individual thoroughly familiar with the operation of each special system. Special systems shall include electrical and communications equipment requiring operating instructions, inspection or periodic maintenance. The person instructing the Owner shall see that the Owner is conversant with the operation of the system and its various controls; the company from whom maintenance service and repairs may be obtained; and the location and function of switches, devices and accessories, contained in the system.
- E. Operations and Maintenance Manuals shall be supplied containing the following:
 - 1. Operation, maintenance, recommended spare parts, and renewal parts information for equipment furnished.
 - 2. Set of complete, final, as reviewed and accepted information required to be submitted for review.
 - 3. As-constructed electrical, equipment, and installation drawings.
 - 4. Index of equipment suppliers listing current names, addresses and telephone numbers of those who should be contacted for service.
 - 5. As-constructed contract drawings permanently marked in red to show departures from original drawings.
 - 6. Submit one (1) copy for review. This copy will be returned. Submit three (3) final revised copies.

1.5 PERMITS AND INSPECTIONS

- A. Obtain, furnish and include the costs of necessary permits, fees and inspection certificates for material and labor furnished. Include costs of permits, certificates and inspection fees required in connection with the installation, unless otherwise noted in the detailed contractual description preceding these Electrical Specifications.
- B. On completion of work, furnish satisfactory evidence that work is acceptable to regulatory authorities having jurisdiction.
- C. Be responsible to see that the proper inspection authorities are notified when inspections are required by Code and provide necessary assistance to the inspector during inspection.

1.6 REGULATIONS

- A. Installation shall conform to or exceed the minimum requirements of the NEC, and federal, state, local and municipal ordinances.
- B. Work shall be performed in accordance with applicable recommendations of the ADA and OSHA.
- C. Installations shown on drawings or required in the specifications that exceed the minimum requirements of the NEC or other regulations shall be installed as shown or specified.

1.7 CONTRACT DOCUMENTS

- A. Intent of the drawings and specifications is to describe the complete installation. At the conclusion of construction, the electrical system shall be turned over to the Owner complete and ready for safe, efficient operation.
- B. Drawings and the specifications are intended to be cooperative and supplementary. Closely check the drawings and specifications for any obvious errors or omissions and bring any such condition to the attention of the Architect/Engineer prior to the receipt of bids, in order to permit clarification by means of a mailed Addendum.
- C. Drawings for electrical work are in part diagrammatic, intended to convey the scope of work, general arrangement, approximate sizes, and locations of equipment and materials. Exact locations shall be determined to best fit the layout of the job. Scaling of the drawings will not be sufficient or accurate for determining these locations. Where job conditions require reasonable changes in indicated locations and arrangement, make such changes as directed by the Architect/Engineer, without additional cost to the Owner.
- D. A complete set of contract documents shall be on the site at all times. Prior to installing the work, check drawings for dimensions and conflicts.
- E. Rules
 - 1. Where the context requires, the singular includes the plural and the plural includes the singular.
 - 2. The use of "and" in a combined provision means that all elements in the provision must be complied with or must exist to make the provision applicable. Where compliance with one or more elements suffices, or where existence of one or more elements makes the provision applicable, "or" (rather than "and/or") is used.
 - 3. "Shall" is mandatory and "may" is permissive.

1.8 RESPONSIBILITY

- A. Examine the project site and become familiar with existing conditions that will affect the work. Review the drawings and specifications of other trades and take note of conditions to be created which will also affect the work.
- B. Provide sensors, equipment and supervision required for work in "confined spaces".
- C. No energized conductors shall be exposed at any time except when the immediate area is under the direct supervision of a qualified electrician.
- D. Provide temporary insulated magnetic covers for open panelboards. Use SP Products (1-800-233-8595) Type TPC xx-xx or approved equivalent.
- E. Locate equipment, which must be serviced, operated or maintained, in fully accessible positions.
- F. Verify location and size of each motor, and properly connect motors.
- G. Responsibility shall not end with installation and connecting of various apparatus. Include services of an experienced superintendent who shall be constantly in charge of the work. Provide qualified journeymen, helpers and laborers required to properly unload, install, connect, adjust, start, operate and test the work involved, including equipment and materials furnished by other trades or by the Owner.

1.9 DAMAGE

- A. Be responsible for damage to the work of other trades or to the building and its contents caused by the electrical installation.

1.10 GUARANTEE AND MAINTENANCE

- A. Material and equipment shall be fully guaranteed to be free from defects and to be new equipment. No secondhand, used or salvaged equipment will be allowed.
- B. Keep entire portion of the work in repair, so far as defects in workmanship, apparatus, material or construction are concerned, without additional cost to the Owner, for one (1) years from the date of final acceptance, except as otherwise specified.
- C. Equipment installed which fails to meet performance ratings specified or shown on drawings shall be removed and replaced by new equipment which meets specified requirements, without additional cost to the Owner.
- D. Material and workmanship shall be subject to the review of the Architect/Engineer, in whose presence various tests shall be made as required by these specifications.

PART 2 PRODUCTS

2.1 STANDARDS OF MATERIALS AND WORKMANSHIP

- A. Material shall be new, complete with manufacturer's guarantee or warranty, and shall be as listed by UL, if a standard has been established by UL for the type of material. Approved manufacturers shall be firms regularly engaged in the manufacture of equipment of types and capacities required and whose products have been in satisfactory use in similar service for not less than three years.
- B. Methods and techniques of installation shall be subject to review by the Architect/Engineer.
- C. Material shall be the standard product of a reputable manufacturer regularly engaged in the manufacture of the specific product. Materials of the same type or class shall be the products of one manufacturer. For example, panelboards shall be from the same manufacturer and lighting switches from the same manufacturer.
- D. Material shall be protected from damage and stored indoors at all times, unless other storage arrangements are reviewed by the Architect/Engineer.
- E. Material and equipment shall be installed in strict accordance with the manufacturer's recommendations.
- F. The equipment manufacturer and installing contractor shall carefully check that the installed, operating equipment can be properly serviced. If the manufacturer or the contractor has any reservations in this regard, they shall state their reservations and suggested changes in a separate letter addressed to the Architect/Engineer and shall include this letter as part of their shop drawing submission. Architect/Engineer will work out required changes and adjustments in contract prices where such adjustments are warranted. No adjustment in contract price will be allowed for additions required by applicable code, ordinance, statute, utility regulation or labor regulation. It is the obligation of the contractor to include such items in his original bid. Changes in equipment shall be incorporated in shop drawings.

If the contractor fails to call such reservations or suggestions to the Architect/Engineer's attention, in writing, before any work is done or equipment is purchased, it shall be assumed that the contractor accepts the responsibility for providing a safe, coordinated, and complete installation. If at a later date, changes become necessary to assure a safe, coordinated, and complete installation, the changes shall be made without increase in contract price.

- G. Equipment, devices, apparatus, systems and installations shall be entirely suitable and safe for each intended application in every respect and must not create conditions which would be harmful to

occupants of the building, to operating personnel, to installation personnel, to testing personnel, to workmen or to the public. The contractor shall be solely responsible for providing installations that will meet these conditions. If the contractor believes that the installation will not be safe for all parties, he shall so report to the Architect/Engineer, in writing, before any equipment is purchased or work is installed, giving his exact recommendations.

- H. Where the specifications or drawings state that equipment shall be "furnished," "installed" or "provided," it shall be understood to mean that the contractor shall furnish and install that equipment completely, unless it is specifically stated that the equipment is to be furnished or installed by other trades, public utility companies or the Owner.

2.2 MATERIAL SUBSTITUTIONS

- A. Proposals as submitted shall be based on the products specifically named in the specification or the equivalent. Furnishing material or equipment by manufacturers other than those specified shall only be by permission of the Architect/Engineer. Such permission for substitution must be requested, by the Bidder/Vendor, in writing, at least eleven (11) calendar days prior to bid opening time. The request shall identify the differences in the alternate material or equipment as compared to that specified and shall indicate the benefits to the project as a result of selecting the alternative.
- B. Furnish to the Architect/Engineer, when requested, samples of proposed material or equipment substitutions. These samples shall remain with the Architect/Engineer as long as they desire.
- C. Changes required by alternate equipment shall be made at no additional cost to the Owner. Re-design costs incurred by the Architect/Engineer and costs incurred by other trades, public utilities, or the Owner as a result of the use of such equipment shall be the responsibility of the Contractor.
- D. The Architect/Engineer reserves the sole right for the approval of proposed material or equipment, and the phrase "or an approved equivalent" used in these specifications or on the drawings shall be interpreted to mean an equivalent approved by the Architect/Engineer.
- E. The Architect/Engineer reserves the right to refuse approval of equipment which does not meet the specification, in their opinion, or of equipment for which no local experience of satisfactory service is available. The Architect/Engineer further reserves the right to reject equipment for which maintenance service and the availability of replacement parts is questionable.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

- A. Locate and protect existing utilities and other underground work in a manner that will ensure that no damage or service interruption will result from excavating or other site or building work.

3.2 TEMPORARY UTILITIES

- A. Provide temporary electrical utilities as described in the detailed contractual description preceding the Electrical Specifications.
- B. Provide temporary lighting, as required, to light all construction areas, ramps, runways, corridors, shops, and storage areas to a minimum of 10 foot-candles while any work is in progress. First aid stations, infirmaries and offices shall be lit to a minimum of 30 foot-candles.
- C. Temporary services shall meet OSHA requirements.
- D. Pay costs necessary to remove or relocate any existing private, public, or municipally owned electrical service or telephone service, which are on or adjacent to the Owner's property, and which will interfere with or would be disturbed by the work of this trade or any other trade on this project.
- E. Expedite the work of installing the main service and other work necessary so that the heating system may be operated when required, as directed by the Architect/Engineer.

3.3 FIRESTOPPING

- A. Furnish and install "through-penetration fire stop systems," consisting of field constructed assemblage of products and materials, designed to prevent the spread of fire and gases through fire-rated openings which are commonly made through walls and floors to accommodate penetrants such as: busway, cable tray, electrical cables, and conduits.
- B. "Through-Penetration Fire Stop" is a material, device or construction installed to resist, for a prescribed time, the passage of flame, heat and gases through openings which penetrate the entire fire resistive construction in order to accommodate penetrating items. Incorporating the use of specific products installed in a specific manner, they shall only be installed in configuration for which they have been specifically tested and listed by UL or FM per UL-1479 or ASTM E-814.
- C. Where a specific fire stop system is not specified for a through-penetration, the contractor shall include proposed fire stop system designs in submittals.
- D. Where there is no specific UL fire stop system available for a particular application, the contractor shall obtain from the fire stop manufacturer a system drawing to be submitted for approval, prior to installation.
- E. Holes or voids used to extend electrical installation through fire-rated floors, ceilings and walls shall be fire-stopped with a fire-resistant foam sealant to prevent the passage of smoke, fire, toxic gas or water through the penetration either before, during or after a fire. Chase Technology Chase-Foam, CTC PR-855.
- F. The materials and components of an approved fire stop system shall be the products of a single manufacturer and shall not be inter-mixed.
- G. Fire stop materials used shall be suitable and compatible with the penetrating item(s) including the surrounding materials.
- H. Fire stop materials used in exposed area shall be paintable and finished with similar surface treatments as used on the surrounding wall or floor surface.

3.4 IDENTIFICATION

- A. Each device shall be identified according to the following system:
 - 1. Panels and switchboard shall be identified as to panel designation, voltage and feeder, e.g., "Panel L1, 120/208 volts, Feeder FDP-1." Markings shall be outside the door.
 - 2. Magnetic motor starters, safety switches, and remote push button stations shall be identified with the starter number, name and number of device controlled, and circuit number, e.g., "MS-1, Air Handling Unit 1, Circuit L1-24".
 - 3. Manual motor starters shall be identified with the name and number of the device controlled and circuit number, e.g., "Exhaust Fan 1, Circuit L1-31".
 - 4. Time clocks, contactors and relays shall be identified with a nameplate indicating the devices controlled, e.g., "Security Light".

5. Exhaust fans shall be identified at the disconnect switch with the circuit number.
 6. Service disconnecting means shall be permanently identified on the exterior, e.g., "Main Service Disconnect".
 7. Panel circuit number shall be identified on the convenience outlet and light switch box, or the backside of the plate with embossed lettering plastic tape or indelible marking pen.
 8. Junction and pull box covers shall be labeled with circuits contained within. Mark on outside with permanent marker in concealed or mechanical spaces, or inside the cover in public areas.
 9. Three phase outlet cover plates shall have special 1/8" engraved lettering "208 volt, 3 phase".
- B. Identification shall be engraved, laminated plastic using white letters on black background, unless otherwise specified.
- C. Feeders located in tunnels, pipe chases, or other accessible locations shall be identified as to feeder number and voltage at least once, and then at 50 feet intervals. Means of identification shall be white stenciled letters, 1-1/2 inches high, on a black background.
- D. Color-coding of branch circuit wiring shall be as stated in the NEC. Color-coding of neutral conductors in conduit with multi-circuits shall be as stated in the NEC. Wires of sizes larger than No. 8 AWG shall be color coded by a strip around the conductor at junctions, pull boxes and terminating points.
1. Color-coding of wiring shall be black (A phase), red (B phase), blue (C phase) for 120/208-volt three-phase system with white neutral.
 2. Color-coding of grounding wires shall be green.

3.5 ELECTRICAL CONNECTIONS TO EQUIPMENT

- A. Furnish power wiring for the temperature control equipment.
- B. Cooperate with other trades on the locations of the outlet boxes, switches, and controls.
- C. Devices or equipment requiring both electrical and mechanical connections shall be installed by the contractor furnishing the device or equipment. Remaining connections shall then be made by the appropriate contractor.
- D. Where circuits serving specific items of equipment are shown on the electrical drawings, the breaker ratings, number of poles, and conductor sizes are nominal for the general class of equipment that includes each specific item. Final sizes shall be coordinated with the Owner or with the contractor furnishing the equipment.

3.6 EQUIPMENT BY OTHER CONTRACTORS

- A. Verify with other contractors the location of equipment requiring electrical connection, including control devices that are supplied by the other contractors. Make any necessary changes before roughing-in for power and control power circuits.
- B. Review drawings and specifications and be responsible for the proper electrical connection of equipment. Furnish labor and material, including flexible conduit for movable equipment, to completely connect outlets, receptacles, switches, starters, and limit switches for equipment furnished by other contractors.
- C. Review other sections of this specification and be responsible for connecting the equipment to operate as described.

3.7 EQUIPMENT BY MECHANICAL CONTRACTOR

- A. The Mechanical Trades will furnish motors for items supplied by them. Furnish necessary labor and material, including wire and lugs, to completely connect the equipment.
- B. Interlock contacts required on starters shall be furnished by the Electrical Contractor.
- C. Review other sections of this specification and be responsible for connecting the equipment to operate as described.

3.8 INTERRUPTIONS

- A. Changes in electrical services shall be made so as to provide a minimum of interference with the operation of services in the building. When changes require shutdown of building services, notify the proper building authorities not less than 7 days in advance and obtain approval from these authorities before making changes. Such notices shall give duration and nature of shutdown. Temporary arrangements shall be approved by the Architect/Engineer or Owner.
- B. Commissioning of fire alarm systems shall be coordinated with the Owner.
- C. Include costs for temporary wiring and overtime work required, in the Contract price. Remove temporary wiring at the completion of work.

3.9 ROOF OPENINGS

- A. Roof openings required that are not shown on the structural or architectural drawings shall be cut and (if necessary) reinforced by the roofing contractor, and not by electricians.

3.10 CUTTING AND PATCHING

- A. Provide cutting and fitting necessary to properly install work, unless specifically noted otherwise in these specifications or shown on the drawings. Coordinate with other trades as required to minimize the damage and the amount of patching required.
- B. Lay out work carefully in advance. Do not cut or notch any structural member or building surface without specific approval. Carefully carry out any cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings, paving or other surfaces required for the installation, support, or anchorage of conduit, raceways, or other electrical materials and equipment.

3.11 PAINTING

- A. No painting or finishing is to be included under this contract except as noted. The finish of any item that has been marred, scratched, or damaged in any way, shall be repainted to the satisfaction of the Architect/Engineer and the Owner.

3.12 CLEANING OF PREMISES

- A. Keep the premises clean of debris caused by the work at all times. Keep material stored, in areas designated by the Owner, in such a manner so as not to interfere with the progress of the work of other trades or with the operation of existing facilities.
- B. Interiors and exteriors of electrical panels shall be thoroughly cleaned.
- C. At the conclusion of the construction, the site shall be thoroughly cleaned of rubble, debris and unused material and shall be left in good order. Closed off spaces shall be cleaned of waste material, cartons, and wood frame members used in the construction.

3.13 RECORD OF CHANGES MADE TO THE WORK

- A. Maintain at the job site a separate and complete set of electrical plans and specifications upon which it is clearly and permanently marked in red and noted, in complete detail, any changes made. Include changes to location and arrangement of electrical apparatus or changes made in the electrical system and wiring as a result of building construction conditions or as a result of written instructions from the Architect/Engineer. Such record of changes shall be made daily and the marked plans and specifications shall be available for the Architect/Engineer's examination at any normal work time.
- B. Upon completion of the job, and before final payment is made, transmit the marked-up plans and specifications to the Architect/Engineer.

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**SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Electrical equipment coordination and installation.
 - 2. Sleeves for raceways and cables.
 - 3. Sleeve seals.
 - 4. Grout.
 - 5. Common electrical installation requirements.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. None Required.

1.5 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wire-ways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

PART 2 PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 2. Pressure Plates: Carbon steel. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Comply with applicable provisions of Occupational Safety and Health Act (OSHA), NFPA Standards and Pamphlets, NEIS Standards, and common work place practice.
- C. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- D. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- F. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wire-ways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.

- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials.
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly.

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**SECTION 26 05 01
MINOR ELECTRICAL DEMOLITION**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Electrical demolition.

1.2 RELATED REQUIREMENTS

- A. Section 01 7000 - Execution and Closeout Requirements: Additional requirements for alterations work.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as shown on Drawings.
- B. Demolition drawings are based on casual field observation and existing record documents.
- C. Report discrepancies to Architect/Engineer before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate electrical distribution service outages with School District project representative.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Notify School District before partially or completely disabling system.
 - 2. Notify local fire service.
 - 3. Make notifications at least 24 hours in advance.
 - 4. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
 - 1. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.

- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- F. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- G. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- H. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.4 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that remain or that are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Single conductor building wire.
- B. Wiring connectors.
- C. Electrical tape.
- D. Wire pulling lubricant.

1.2 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

1.3 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010.
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2009).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; National Electrical Manufacturers Association; 2009 (ANSI/NEMA WC 70/ICEA S-95-658).
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; International Electrical Testing Association; 2013 (ANSI/NETA ATS).
- I. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- K. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- L. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- M. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- N. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- O. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Architect/Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

- A. None required.

1.6 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect/Engineer and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 26 0526.
- H. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B 787M unless otherwise indicated.
 3. Tinned Copper Conductors: Comply with ASTM B33.
- I. Minimum Conductor Size: 12 AWG.
- J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- K. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.

2.3 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
1. Copper Building Wire:
 - a. General Cable
 - b. The Okonite Company
 - c. Southwire Company: www.southwire.com
 - d. Superior Essex
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Single conductor insulated wire.

- C. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN-2, except as indicated below.

2.4 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 0526.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
 - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 - 3. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
 - 4. Stranded Conductors # 10 AWG and larger: Use crimped terminals for connections to terminal screws.
- E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- G. Mechanical Connectors: Provide bolted type or set-screw type.
- H. Compression Connectors: Provide circumferential type or hex type crimp configuration.
- I. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.5 WIRING ACCESSORIES

A. Electrical Tape:

1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

B. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as shown on the drawings.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated and routing is not shown, determine exact routing required.
3. Include circuit lengths required to install connected devices within 10' of location shown.
4. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
5. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are shown as separate, combining them together in a single raceway is permitted, under the following conditions:
 - a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
 - b. Increase size of conductors as required to account for ampacity derating.
 - c. Size raceways, boxes, etc. to accommodate conductors.
7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is permitted where not otherwise prohibited, except for the following:

- a. Branch circuits fed from ground fault circuit interrupter (GFCI) circuit breakers.
 - b. Branch circuits fed from feed-through protection of GFI receptacles.
 - c. Branch circuits with dimming controls.
 - d. Branch circuits with isolated grounding conductor.
 - e. Non-linear loads.
- B. Install products in accordance with manufacturer's instructions.
- C. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.
- D. Installation in Raceway:
 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 2. Pull all conductors and cables together into raceway at same time.
 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
- G. Terminate cables using suitable fittings.
- H. Install conductors with a minimum of 12 inches of slack at each outlet.
- I. Neatly train and bundle conductors inside boxes, wire-ways, panelboards and other equipment enclosures.
- J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- K. Make wiring connections using specified wiring connectors.
 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 3. Do not remove conductor strands to facilitate insertion into connector.
 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

- L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to un-spliced conductors.
- M. Insulate ends of spare conductors using vinyl insulating electrical tape.
- N. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- P. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.4 FIELD QUALITY CONTROL

- A. Perform inspection, testing, and adjusting in accordance with Section 01 4000.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

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SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.

1.2 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

1.3 REFERENCE STANDARDS

- A. IEEE 81 - Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- C. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; International Electrical Testing Association; 2013 (ANSI/NETA ATS).
- D. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Notify Architect/Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect/Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method or alternate test described in IEEE 81.
- F. Bonding and Equipment Grounding:
 - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 - 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 - 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 - 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 - 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

2.2 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in addition to requirements of Section 26 0519:
 - 1. Use insulated copper conductors unless otherwise indicated.
- C. Connectors for Grounding and Bonding:
 - 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 - 2. Unless otherwise indicated, use exothermic welded connections or compression connectors for underground, concealed and other inaccessible connections.
 - 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.

- B. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.
- C. Make grounding and bonding connections using specified connectors.
 - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 - 3. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 4. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- D. Identify grounding and bonding system components in accordance with Section 26 0553.

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**SECTION 26 05 33
CONDUIT AND RACEWAY**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Conduit and raceway.

1.2 REFERENCES

- A. National Electrical Code (NEC).
- B. Conduit shall carry the Underwriters' Laboratories (UL) label.
- C. Conduit shall meet the following American National Standards Institute (ANSI), National Electrical Manufacturers Association (NEMA) and Federal Specifications (FS) standards:
 - 1. Rigid Steel Conduit (RGS): FS WW-C-581 and ANSI C80.1.
 - 2. Electrical Metallic Tubing (EMT): FS WW-C-563, UL797, and ANSI C80.3.
 - 3. Flexible Metal Conduit: FS WW-C-566, CSA, UL.
 - 4. Liquid-Tight Flexible Metal Conduit: CSA, UL.
 - 5. Rigid Nonmetallic Conduit (PVC): NEMA Standards Pub. No. TC3.

1.3 QUALIFICATIONS

- A. Rigid nonmetallic conduit shall be Carlon Type 40 PV-DUIT (heavy wall) or approved equivalent.
- B. Liquid-tight flexible metal conduit shall be Electri-Flex, Type LA or approved equivalent.

PART 2 PRODUCTS

2.1 REQUIREMENTS

- A. Conduit smaller than ¾-inch diameter shall not be used on this project.
- B. Only threaded type connectors and couplings shall be used with RGS.
- C. RGS, flexible conduit or flexible liquid tight conduit including fittings and hangers used throughout this project shall be galvanized steel.
- D. Connectors for EMT shall be steel or malleable iron. Fittings shall be capable of carrying ground fault currents of 10,000 amps rms for 1½ inch and smaller, and 20,000 amps rms for 2-inch and larger for a minimum of 3 cycles. Fittings shall be Thomas & Betts 5030, 5031, 5120, 5123, or 530 series. Die cast metal fittings will not be permitted on this project. Connectors 2½" and larger shall be compression type. Connectors smaller than 2½" shall be set screw type, or compression type.
- E. Type LA Liqueflex flexible conduit, with appropriate fittings which are UL listed as an assembly, shall be used in a boiler room, kitchen, exterior location, or any moist location.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Wiring shall be in conduit or approved raceways, unless shown otherwise.
- B. Conduit and outlet installation shall be concealed throughout this project, as follows unless otherwise indicated.

1. Conduit or Raceway above suspended ceilings shall be supported from the building structure and not from the ceiling grid hanger wires.
- C. Conduit throughout this project shall be EMT installed with steel support straps except where shown otherwise or as follows:
1. Branch circuit conduits shall not be allowed to be installed under interior slab unless specifically shown on the plans.
 2. Conduits 3 inches trade size and larger for power feeders shall be RGS conduit unless shown otherwise.
 3. Exposed interior conduit routed horizontally below 8 foot above floor or routed vertically, RGS conduit shall be installed for wiring systems.
- D. Conduit shall not be run horizontally in masonry walls or in masonry wall gaps.
- E. Conduit shall not be used as the sole grounding means.
- F. Metallic conduit, cut with a power saw or hacksaw, shall be reamed to remove burrs.
- G. Conduit bends shall be held to as large a radius as possible for ease in pulling of conductors and to provide a neatly installed appearance. The maximum length of straight conduit runs shall be 200 feet between pull boxes, with 50 feet deducted for each 90-degree bend and 25 feet deducted for each 45-degree bend; reduction of length for all other angle bends shall be calculated on a similar basis.
- H. No conduits shall be routed in the floor beneath or near boilers.
- I. Suspended type conduit hangers for 2-inch and smaller conduit shall be with mounting devices, similar to Unistrut or Kindorf beam clamps. Hangers for groups of conduit with any size larger than 2-inch shall be channel type structural shapes, with conduits clamped to channel with U-shaped clamps.
- J. When building ventilation conditions are such that the air may flow continuously in conduits or ducts, the conduit shall be sealed at each end with a pliable duct sealing compound such as Duct-Seal or Kerite Putty, or Chase Technology foam. If conduit is installed with possible access to rodents, the conduit shall be sealed in a manner similar to that described above.
- K. Interferences
1. Conduit runs are not shown to allow this contractor to choose the route to the various electrical devices. However, care shall be taken to coordinate the conduit runs with duct work, beams, joists, plumbing pipes, and plumbing fixtures to be installed by other trades.
 2. When interference develops, the Architect/Engineer will decide which equipment will be relocated; regardless of which apparatus was installed first.
- L. Install conduit and wiring for electrical devices furnished by other trades or by the owner on this project, unless otherwise shown or specified.
- M. Insulated Bushings
1. Conduits shall have insulated bushings installed at entrances to panelboards, starters, pull boxes and shall be secured to the enclosure by the bushing (and lock nut, if necessary) on the inside, and by lock nut on the outside.
 2. Conduits entering distribution type panelboards and the main switchgear shall have insulated grounding bushings similar to T & B 3800 series, with bushings connected together by means of a continuous copper grounding conductor, sized to meet the requirements of the NEC.
- N. Connectors, couplings, and lock nuts shall be tightened securely by use of the proper tools to assure an effective and continuous path to ground through the conduit system.

- O. Wherever conduit crosses a building expansion joint and is constrained from relief deflection (i.e. buried in concrete or a straight run anchored in concrete on both sides of the joint), expansion fittings or expansion/deflection fittings shall be provided.
- P. Where wire is run for a motor connection, to be connected under a separate contract, the conduit shall be terminated in the proper fitting at the correct location.
- Q. A short piece of flexible metal conduit shall be used in the feeder conduit near the motor.
- R. Surface mounted conduit shall be mounted flush to wall and secured by one-hole or two-hole clamps.

END OF SECTION

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**SECTION 26 05 33.01
PULL AND JUNCTION BOXES**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pull, junction, and outlet boxes.

1.2 REFERENCES

- A. National Electrical Code (NEC).
- B. National Electrical Manufacturers Association (NEMA).
- C. Underwriters' Laboratories, Inc. (UL).

1.3 QUALIFICATIONS

- A. Junction and pull boxes shall be as manufactured by Appleton Electric, Arrow-Hart, Bell Electric / Square D, General Electric, O.Z. / Gedney Co., Slater Electric Inc., or approved equivalent.
- B. Conduit bodies shall be as manufactured by Appleton Electric Co., Crouse-Hinds Co., Harvey Hubbell Inc., Killark Electric Mfg. Co., O.Z. / Gedney Co., Pyle-National Co., Spring City Electrical Mfg. Co., or approved equivalent.
- C. Bushings, knockout closures, and lock nuts shall be as manufactured by Appleton Electric Co., Burndy Corp., Crouse-Hinds Co., Gould, Inc., O.Z. / Gedney Co., RACO, Inc., Steel City, Thomas and Betts Co., or approved equivalent.
- D. Interior outlet boxes shall be as manufactured by Appleton Electrical Co., Arrow Conduit and Fittings Corp., RACO, Inc., Steel City / Thomas and Betts Co. or approved equivalent.
- E. Weatherproof outlet boxes shall be as manufactured by Appleton, Bell Electric / Square D Co., Crouse-Hinds Co., Harvey Hubbell, Pyle-National, or approved equivalent.
- F. Weatherproof outlet boxes for "unattended wet locations while in use" per NEC 406.8(B) (latest edition), Tay Mac Series 20xxx or approved equivalent.

PART 2 PRODUCTS

2.1 REQUIREMENTS

- A. Provide galvanized, UL-code gauge sheet steel junction and pull boxes, with screw-held covers. Type, shape, and size shall be as required to suit each respective location and installation. Boxes shall have welded seams with stainless steel nuts, bolts, screws and washers.
- B. Provide galvanized cast-metal conduit bodies of type, shape, and size to suit each respective location and installation. Bodies shall have threaded conduit entrances, removable covers, and corrosion resistant screws.
- C. Provide corrosion resistant, punched-steel box knockout closures, conduit locknuts and malleable iron conduit bushings, and offset connectors of type and size to suit respective uses and installation.
- D. Outlet Boxes
 - 1. Interior outlet boxes shall be galvanized flat rolled sheet steel, of the type, shape, and size, including box depth to suit each respective location and installation. Boxes shall have stamped knockouts in back and sides and with threaded screw holes with corrosion-resistant screws for securing box covers and wiring devices.
 - a. Provide mounting brackets, wall board hangers, extension rings, fixture studs, cable clamps, and metal straps to rigidly support outlet boxes as required for each outlet location.

2. Weatherproof outlet boxes shall be corrosion-resistant cast-metal wiring boxes of the type, shape and size, including box depth to suit each respective location and installation. Boxes shall have threaded conduit ends and threaded screw holes with corrosion-resistant screws for securing box covers and wiring devices.
3. Weatherproof switch and receptacle cover plates shall be case aluminum or zinc die cast with spring hinged waterproof caps, faceplate gaskets, and corrosion-resistant fasteners.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Provide pull and junction boxes where required in Part 3 of Section 26 0533 - *Conduit and Raceway*. Unless specifically shown on the drawings to be larger than required by the NEC, size pull and junction boxes in accordance with the minimum volumes set forth in the NEC.
- B. Fasten boxes rigidly to structural surfaces to which they are to be mounted or, solidly embed in concrete or masonry.
- C. Provide electrical grounding connections for installed boxes.
- D. Junction boxes above inaccessible ceilings for power, lighting, communication, and signal systems shall be located about one (1) foot from a recessed fluorescent fixture to allow easy access to the junction box, by removal of the fixture.
- E. Outlet Boxes
 1. Provide 4" x 4" galvanized pressed steel outlet box at each receptacle, wall mounted light fixture, task light, wall switch, or any other device shown.
 2. Outlet boxes exposed to weather or located in damp locations shall be galvanized cast iron, or malleable iron, or cast aluminum. Weatherproof switches and receptacles shall be mounted in "FS" (4-point mounting) boxes.
 3. Outlet boxes shall be plumb and level and shall be firmly secured in position, with the face of the box flush with the finished wall or ceiling.
 4. Remove only knockouts which are required for connection of conduit or insertion of conductors. Provide plugs for unused openings.
 5. Conduit shall enter box squarely and shall be secured by means of lockout on outside and insulated bushing inside.
 6. Provide electrical grounding connections for installed boxes.
 7. Outlet boxes mounted on opposite side of fire rated walls shall have a minimum 24" horizontal spacing.
 8. Outlet boxes mounted on opposite side of non-fire rated walls shall have a minimum of 6" horizontal spacing.
 9. Outlet boxes shall be mounted 18" above finished floor to center of box for receptacles and 48" for switched unless shown otherwise on the drawings.

END OF SECTION

SECTION 26 2726

WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wall plates.

1.2 RELATED REQUIREMENTS

- A. Section 26 0533.01 – Pull and Junction Boxes.

1.3 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- D. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2010).
- E. NEMA WD 6 - Wiring Device -- Dimensional Specifications; National Electrical Manufacturers Association; 2002 (R2008).
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- H. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- I. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- K. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
 - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
 - 4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.

5. Notify Architect/Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Field Quality Control Test Reports.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Operation and Maintenance Data:
 1. GFI Receptacles: Include information on status indicators and testing procedures and intervals.
- F. Project Record Documents: Record actual installed locations of wiring devices.
- G. Maintenance Materials: Furnish the following for Mediapolis Community School District's use in maintenance of project.
 1. See Section 01 6000 - Product Requirements, for additional provisions.

1.6 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Products: Listed, classified, and labeled as suitable for the purpose intended.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Hubbell Incorporated: www.hubbell-wiring.com
- B. Leviton Manufacturing Company, Inc: www.leviton.com
- C. Cooper Wiring Devices
- D. Lutron Electronics Company, Inc: www.lutron.com
- E. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

- F. Wattstopper.
- G. Source Limitations: Where possible, for each type of wiring device furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. Provide weather resistant GFI receptacles with specified weatherproof covers for all receptacles installed outdoors or in damp or wet locations.
- C. Provide GFI protection for all receptacles installed within 6 feet of sinks.
- D. Provide GFI protection for all receptacles installed in kitchens.
- E. Provide GFI protection for all receptacles serving electric drinking fountains.

2.3 WIRING DEVICE FINISHES:

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: White with stainless steel wall plate.
- C. Wiring Devices Installed in Finished Spaces: White with stainless steel wall plate.

2.4 WALL SWITCHES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell-wiring.com .
 - 2. Cooper Wiring Devices
 - 3. Leviton Manufacturing Company, Inc: www.leviton.com .
 - 4. Lutron
 - 5. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
 - 6. Wattstopper.
 - 7. Substitutions: See Section 01 6000 - Product Requirements.
- B. All Wall Switches: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- D. Locking Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed switch actuator and maintained contacts; all switches keyed alike; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- E. Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with toggle type three position switch actuator and momentary contacts; single pole double throw, off with switch actuator in center position.

- F. Locking Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed three position switch actuator and momentary contacts; all switches keyed alike; single pole double throw, off with switch actuator in center position.

2.5 WALL DIMMERS

- A. All Wall Dimmers: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

2.6 RECEPTACLES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell-wiring.com .
2. Cooper Wiring Devices.
3. Leviton Manufacturing Company, Inc: www.leviton.com .
4. Lutron Electronics Company, Inc; Designer Style: www.lutron.com .
5. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

- B. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.
3. Hospital Grade Receptacles: Listed as complying with UL 498 Supplement SD, with green dot hospital grade mark on device face.

C. Convenience Receptacles:

1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R,, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
3. Illuminated Convenience Receptacles: Hospital grade, 20A, 125V, NEMA 5-20R; illuminated face or indicator light to indicate power is being supplied to receptacle; single or duplex as indicated on the drawings.

D. GFI Receptacles:

1. All GFI Receptacles: Provide with feed-through protection, light to indicate ground fault tripped condition and loss of protection, and list as complying with UL 943, class A.
 - a. Provide test and reset buttons of same color as device.
2. Standard GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Weather Resistant GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.7 WALL PLATES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell-wiring.com .
2. Leviton Manufacturing Company, Inc: www.leviton.com .
3. Lutron Electronics Company, Inc: www.lutron.com .
4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wall plates by the same manufacturer in locations indicated.

B. All Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
2. Size: Standard
3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Steel Wall Plates: .035-inch, 18-8 stainless steel type 302 in satin or brushed finish.

D. Pre-marked Wall Plates: Factory labeled as indicated; hot stamped for nylon wall plates and engraved for metal wall plates.

E. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0537 as required for installation of wiring devices provided under this section.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switches: 48 inches above finished floor.
 - b. Wall Dimmers: 48 inches above finished floor.
 - c. Receptacles: 18 inches above finished floor or 6 inches above counter.
 - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 - 3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
 - 4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect/Engineer to obtain direction prior to proceeding with work.
 - 5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFI receptacles with integral GFI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.
- K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- L. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- M. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on left.
- N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

- O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- P. Identify wiring devices in accordance with Section 26 0553.

3.4 FIELD QUALITY CONTROL

- A. Perform field inspection, testing, and adjusting in accordance with Section 01 4000.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

3.6 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

**SECTION 26 28 13
FUSES**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fuses.

1.2 REFERENCES

- A. Underwriters' Laboratories, Inc. (UL).

1.3 SUBMITTALS

- A. Submit the following information in accordance with Section 01 3000 Administrative Requirements.
 - 1. List of fuse types and manufacturer.
 - 2. Time- current curves.
 - 3. List of spare fuses to be provided.

1.4 QUALIFICATIONS

- A. Fuses shall be by Bussmann Manufacturing Division of McGraw Edison Company or by Littlefuse Tracor Company.
- B. Fuses shall be UL listed for 200,000 ampere RMS interrupting capacity.

PART 2 PRODUCTS

2.1 FUSES

- A. Fuses shall be capable of interrupting the available fault without rupturing or damaging fuse clips, buswork, cable or switching components, and shall safely contain within the insulated barrel of the fuse the smoke, hot gases, carbon, and other harmful by-products of the fault.
- B. Fuses 601 amperes and larger shall be UL Class L current limiting bolt-in rejection type: Bussmann KRP-C Hi-CAP or Littlefuse KLP-C type. They shall have at least 45-second time delay at 200% rating.
- C. Fuses rated 600 amperes or less shall be UL Class R rejection type with time current characteristics as defined by the Bussmann or Littlefuse catalog number shown for each condition outlined herein.
- D. Fuses protecting molded case circuit breakers or molded case circuit breaker panels shall be current limiting silver link types. They shall have interrupting capacity and let through current as defined by the Bussmann or Littlefuse catalog type shown below, unless otherwise indicated or required by the circuit breaker manufacturer.
 - 1. 125- and 250-volt molded case circuit breakers shall be fed from switches fused as follows:
 - a. 0 to 60 amperes Bussmann LOW PEAK fuses Type LPN-R or Littlefuse Type LLN-RK.
 - b. 70 to 200 amperes Bussmann Limitron Fuses Type KTN-R or Littlefuse Type KLN-R.
 - 2. 277-, 480-, and 600-volt molded case circuit breakers shall be fed from switches fused as follows:
 - a. 0 to 100 amperes Bussmann LOW PEAK fuses Type LPS-R or Littlefuse Type LLSRK.

- b. 110 to 300 amperes Bussmann Limitron Fuses Type KTS-R or Littlefuse Type KLSR.
- E. Fuses not sized on the drawings for motor running protection, 100 amperes or less, shall be as follows:
 - 1. Fuses shall be Bussmann Fusetron (or Littlefuse "SLO BLO") dual-element time delay type FRN-R (or FLNR) for 250 volts or less, and FRS-R (or FLSR) for 277 through 600 volts sized at 125% of the motor nameplate full load running amperes or the next larger NEC standard ampere size. Exceptions to the preceding are where excessive ambient temperature, high inertia motor loads, special motors, or frequent "ON-OFF" cyclic loads or other special circumstances require a larger or different type fuse to be approved by the Architect/Engineer. Such special circumstances shall be clarified with the Architect/Engineer not less than 72 hours prior to bid opening time.
 - 2. Fuse reducers shall be used where switch fuse clip spacing is larger than the length of the required fuse.
- F. Plug fuses shall be Fustat Bussmann Type S (or Littlefuse Type S).
- G. Fuses for protection of grouped or racked lighting fixture ballasts shall have 100,000 amperes RMS interrupting capacity, shall be similar to Bussmann fuse type GLR mounted in type HLR fuse holders (or Littlefuse type LGR in LHR holders) and shall be ampere sized as recommended by the ballast manufacturer.
- H. Fuses for protection of each individual exterior pole mounted light fixture or ballast shall have 100,000 amperes RMS interrupting capacity and shall be Bussmann fuse Type KTK mounted in Type HEB (or Littlefuse type KLK in HLB holder) fuse holders located in a hand hole at the base of the pole or in a weatherproof fuse enclosure located on the pole, as shown on the drawings.
- I. Other fuses, unless otherwise noted, shall be dual-element, current limiting, silver link type Bussmann LOW PEAK fuse, Type LPN-R or Littlefuse Type LLNRK for circuits rated 250 volts or less, and Bussmann LOW PEAK fuse Type LPS-R or Littlefuse Type LLSRK for circuits rated 277 through 600 volts. They shall have at least 10 seconds time delay at 500% rating.

PART 3 EXECUTION

3.1 FUSES

- A. Fuses shall be installed as shown on the drawings after inspections and the installations have been completed. Fuses shall be of the same manufacturer to retain selectivity and electrical coordination as designed. Fuses shall have dimensions and rejection features exactly as defined herein. Fuses having any other type of rejection feature are not acceptable.
- B. Twenty percent spare fuses for each size, including control circuit fuses of each amperage and voltage rating (minimum of 3), shall be furnished to the Owner.

END OF SECTION

**SECTION 26 28 16
DISCONNECT SWITCHES**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Safety disconnect switches.

1.2 REFERENCES

- A. National Electrical Manufacturers Association (NEMA).
- B. Underwriters' Laboratories, Inc. (UL).

1.3 SYSTEM DESCRIPTION

- A. Disconnect switches provide safe disconnecting of electrical power to equipment.

1.4 SUBMITTALS

- A. Submit the following information in accordance with Section 01 3000 Administrative Requirements.
 - 1. Outline drawing with dimensions.
 - 2. Equipment Ratings.
 - a. Voltage.
 - b. Capacity.
 - c. Horsepower.
 - d. Short circuit withstand rating.

1.5 QUALIFICATIONS

- A. Safety switches shall be NEMA heavy-duty type and shall carry the UL label. Fusible switches shall incorporate Class "R" fuse rejection feature and shall be braced to withstand 50,000 ampere RMS symmetrical fault current.
- B. Switches shall be of the manufacturer Square D, ABB/General Electric and Eaton.
- C. Safety switches used for service entrance equipment shall be UL listed as suitable for service entrance.

PART 2 PRODUCTS

2.1 SWITCHES

- A. Provide heavy-duty type, sheet steel enclosed, safety switches. Type, size, and rating shall be as shown on the drawings or as required by the motor or equipment served. Switches shall be lockable in the "ON" and "OFF" positions.
- B. Switches shall incorporate quick-make, quick-break operating handles. Mechanism shall be an integral part of the box, not the cover, and switches shall have a cover interlock to prevent unauthorized opening of the switch door in the on position or closing of the switch mechanism with the door open. Current carrying parts shall be constructed of high-conductivity copper with silver-tungsten type switch contact.
- C. Fuse clips shall be positive pressure type reinforced rejection type fuse clips.
- D. Indoor enclosures shall be NEMA 1. Enclosures for wet locations and for outdoor use shall be NEMA 3R.

- E. Equip each motor disconnect with auxiliary contacts (1-NO, 1-NC). Disconnect switches utilized with variable speed motor controllers shall be interlocked with the drive control circuit.

PART 3 EXECUTION

3.1 SWITCHES

- A. Furnish and install safety disconnect switches (fused and non-fused) shown on the drawings. In addition, furnish a safety disconnect switch for motors and equipment which do not have combination starters or integral disconnecting means.
- B. For mechanical equipment rated for use only with fuses (such as condensing units, compressors, chillers), provide fusible disconnect switches. Such switches shall be one, two or three pole type, with solid neutral for 4- wire service, and shall have the proper current and voltage rating as required.
- C. Terminals of the proper size for wire as shown on the drawings for line, load and ground shall be supplied by the disconnect switch manufacturer.
- D. Each motor shall be individually protected. Furnish a safety disconnect for each motor as required by the NEC.
- E. Disconnect switches shall not be directly mounted to equipment which is mounted on vibration isolation pads or springs, unless a piece of flexible conduit is used between the disconnect switch and the fixed conduit.
- F. Safety switches shall be mounted securely to walls, columns or machine frames, and provided with brackets, mounting devices, structural pieces and expansion type anchor inserts necessary for this purpose. Switches shall not be mounted directly to metal surfaces or to concrete or masonry walls. Structural channels such as Kindorf or 3/4" plywood shall be used to mount switches at least 3/4 inch away from the mounting surface.
- G. Switches shall be mounted at a height of 60 inches above the finished floor to the top of the back box.
- H. Coordinate fuseable switches and fuse sizes, with mechanical trades, where required by UL listing for mechanical equipment installation.
- I. Motors larger than 1/8 horsepower and controllers shall have a disconnecting means within sight and within 50'.
 - 1. Combination motor starters, circuit breakers in panelboards, manual motor starters, integral disconnecting means on equipment, and cord/plug connections may be used as disconnecting means where they are within sight and 50' of the equipment.
 - 2. Switches, combination starters, and circuit breakers which are pad-lockable in the "OFF" position may be used as disconnecting means when not in sight or within 50' unless prohibited by local code.
 - 3. Provide a disconnect switch for motors, motor-driven appliances, and controllers not covered by paragraphs A or B above.

END OF SECTION

**SECTION 26 29 13
ENCLOSED CONTROLLERS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Starters.

1.2 REFERENCES

- A. National Electrical Manufacturers Association (NEMA).
- B. Underwriters' Laboratories, Inc. (UL).

1.3 SYSTEM DESCRIPTION

- A. Starters provide control of and protection for electric motors.

1.4 SUBMITTALS

- A. Submit the following information in accordance with Section 01 3000 – Administrative Requirements:
 - 1. Wiring diagrams.
 - 2. Electrical ratings.
 - a. NEMA size.
 - b. Voltage.
 - c. Current.
 - 3. Number of poles.
 - 4. Coil voltage.
 - 5. Physical characteristics including enclosure size.
 - 6. Time - current curves for all breakers requiring settings and fuses.

1.5 QUALIFICATIONS

- A. Magnetic motor starters shall be as manufactured by Allen-Bradley Co., Toshiba, Danfoss, Cutler Hammer/Westinghouse, ABB/General Electric, Siemens, Eaton or Square D.
- B. Manual motor starters shall be as manufactured by Allen-Bradley Co., Toshiba, Danfoss, Cutler Hammer/Westinghouse, ABB/General Electric, Eaton or Square D.
- C. Motor starters shall be by the same manufacturer.

PART 2 PRODUCTS

2.1 MAGNETIC MOTOR STARTERS

- A. Magnetic Motor Starters shall meet the following specifications:
 - 1. Combination magnetic motor starters shall have a fusible disconnect type switch motor circuit protector unless shown otherwise.
 - 2. Provisions for locking the disconnecting means handle in either the ON or OFF position.
 - 3. Minimum starter size shall be NEMA Size 1.

4. Heater element or sensor size shall be based on the nameplate full load current rating of the motor.
5. Each starter shall contain a fused control circuit with the fuse properly sized by the Starter Manufacturer to protect the coil of the starter. Control transformers shall be protected by such a fuse in the primary and secondary circuits of the transformer. Furnish 20% spare fuses of each amperage used (minimum of three) to the Owner.
6. Indoor enclosures shall be NEMA 1, unless shown otherwise.
7. Enclosures for wet locations or outdoor use shall be NEMA 3R, unless shown otherwise.
8. Two speed motor starters and reversing starters shall have time-delay relays to permit motors to coast to a stop prior to restarting at a different speed or reversing. Verify with the motor supplier, whether each two-speed motor is separate winding or consequent pole, prior to submitting shop drawings for the corresponding motor controllers.
9. For each magnetic starter supplied, provide a hand-off-automatic (HOA) selector switch, red run pilot light, (2) no and (2) NC auxiliary contacts, control power transformer with fusing, and heater motor protective elements. Supply additional push buttons, and similar control devices, not specifically furnished by other trades or by the owner but that are required for proper operation of the specific motor. These devices shall be by the same manufacturer as the starters.
10. Motors smaller than ½ horsepower, unless shown otherwise, shall have toggle switch type manual starters with thermal trip (TT) overload protection and pilot light. Flush mounted manual starters shall have a stainless-steel cover plate. Manual starters shall be similar to Square D Type F, Class 2510 Cat. No. FS1P or approved equivalent.
11. Motors, ½ horsepower and larger, shall have magnetic motor starters.
12. Terminals of the proper size for wire (as shown on the drawings for line, load, and ground) shall be supplied by the motor starter manufacturer.

PART 3 EXECUTION

3.1 FINISHES

- A. Furnish and install motor starters and power and control wiring, complete as specified, unless shown otherwise.
- B. Starters shall be mounted securely to walls, columns, or machine frames, and provided with the brackets, mounting devices, structural pieces, and expansion type anchor inserts necessary for this purpose. Starters shall not be mounted directly to metal surfaces or to concrete or masonry walls. Structural channels such as Kindorf or 3/4" plywood shall be used to mount starters at least 3/4 inch away from the mounting surface.
- C. The top of each magnetic motor starter shall be mounted 60 inches above the finished floor unless shown otherwise.
- D. The top of the box for manual motor starters shall be mounted 48 inches above the floor unless shown otherwise.
- E. Motor starters furnished with "hand-off-automatic" switches, but not wired for automatic operation, shall have the reference to automatic deleted from the switch label by paint, revised nameplate, or other permanent means.
- F. Mount motor starters adjacent to or on the equipment served, unless shown otherwise.

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SECTION 26 2923
VARIABLE SPEED MOTOR CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Variable speed motor controllers.

1.2 REFERENCES

- A. Institute of Electrical and Electronic Engineers (IEEE).
- B. National Electrical Manufacturers Association (NEMA).
- C. Underwriters' Laboratories, Inc. (UL).

1.3 SYSTEM DESCRIPTION

- A. Variable speed controllers provide speed control of electric motors. Variable speed motor controllers shall be furnished by the Temperature Controls Contractor and installed and wired by the Electrical Contractor. Startup shall be by the Temperature Controls Contractor.

1.4 SUBMITTALS

- A. Submit the following information in accordance with Section 01 3000 Administrative Requirements.
 - 1. Wiring diagrams.
 - 2. Electrical ratings.
 - a. NEMA size.
 - b. Voltage.
 - c. Current.
 - d. Carrier frequency under normal conditions.
 - e. Drive derating guidelines.
 - 3. Number of poles.
 - 4. Coil voltage.
 - 5. Physical characteristics including enclosure size.
 - 6. Listing of settable parameters.
 - 7. Warranty.
- B. Operation and Maintenance Manuals: Submit in accordance with Section 01 3000 Administrative Requirements.
 - 1. Operations and maintenance manuals shall be forwarded two weeks before shipment of the equipment and copies shall be included with the equipment.
 - 2. The operation and maintenance manuals shall include installation and handling requirements, initial start-up tests and adjustments, maintenance requirements, troubleshooting procedures and renewal parts lists.

1.5 QUALIFICATIONS

- A. Variable speed motor controllers shall be as manufactured by Allen-Bradley Co., ABB Co., Square D Co., or Toshiba-Houston.
- B. Variable speed motor controllers shall be by the same manufacturer.
- C. Variable speed motor controllers shall be furnished with equipment, features, and functions as specified herein and as shown on the drawings. In addition, all controllers shall be furnished with any additional equipment required or recommended by the manufacturer to meet the requirements of these specifications such as isolation transformers, input filters, voltage step-up or step-down transformers, or power factor correction capacitors.
- D. Variable Speed motor controllers shall comply with IEEE Standard 519.

PART 2 PRODUCTS

2.1 VARIABLE SPEED MOTOR CONTROLLERS

- A. Variable speed motor controllers shall meet the following specifications, unless shown otherwise.
- B. Controller shall be provided with a BTL certified BACnet/IP interface card.
- C. Door interlocked disconnect switch.
- D. NEMA 1 ventilated enclosure.
- E. Input fused internally with standard or current limiting fuses.
- F. Bypass circuitry for direct line motor operation with a door mounted inverter/line selector switch.
- G. Start, stop, and speed selection for control of motors.
- H. Frequency range of 6 to 60 Hertz.
- I. Thermal overload relays on output for motor protection (down to approximately one-half motor base speed.)
- J. Short circuit protection, under/over voltage protection, and automatic restarting after a power outage.
- K. Resonance frequency null with field adjustable potentiometers to lock out any resonant speed.
- L. Transducer input for 4 to 20mA ungrounded signal.
- M. Adjustable offset voltages for increasing starting torque.
- N. Adjustable acceleration and deceleration control.
- O. Adjustable maximum frequency and minimum frequency control.
- P. Power ON light.
- Q. Manual-off-automatic selector switch, to select the speed control source, and a manual potentiometer.
- R. Speed indicator and an ammeter.
- S. Items G, N, O and P shall be mounted on the front cover, exposed.
- T. Operating ambient temperature shall be 0°C to 40°C.
- U. Digital operator keypad and display.
- V. Motor rated voltage 208V, 3 phase.

- W. Variable speed controllers shall be of the power transistor type for motors five (5) horsepower or less and of the current source type using diode bridge rectification on the input for motors greater than five horsepower.
 - 1. Pulse width modulated inverters (unless provided with an isolated micro-processor logic power transformer) and voltage source inverters (unless provided with a diode bridge rectifier circuit) shall be acceptable when furnished with isolation transformers and/or filters to limit the interaction among controllers and to prevent interference with other electronics systems such as fire alarm, clock and program, energy management, security, sound, emergency generator, lighting control, etc.
 - 2. Controllers with an input power factor of less than 85% (0.85) at maximum rated speed and power output shall be corrected to 95% (0.95) minimum at maximum output.
- X. Select each variable speed motor controller to agree with the specific motor and motor application it is to control. Prior to submitting shop drawings, obtain information on the exact motor(s) to be supplied and shall select the controller(s) per the manufacturer's recommended procedure.
- Y. Terminals of the proper size for wire as shown on the drawings for line, load and ground shall be supplied by the motor starter manufacturer.

PART 3 EXECUTION

3.1 CONTROLLERS

- A. Controllers shall be mounted securely to walls, columns, or machine frames, and provided with brackets, mounting devices, structural pieces, and expansion type anchor inserts necessary for this purpose. Controllers shall not be mounted directly to metal surfaces or to concrete or masonry walls. Structural channels such as Kindorf or 3/4" plywood shall be used to mount starters at least 3/4 inch away from the mounting surface.
- B. Top of each controller shall be mounted 60 inches above the finished floor unless otherwise noted.
- C. Free-standing controllers shall be mounted on housekeeping pads. See Section 16050 regarding equipment concrete pad.
- D. Variable speed motor controller and control system supplier shall provide factory and field labor for complete calibration testing, and adjustment of the adjustable frequency drives and control components, and be responsible for setting control set points, operating sequences, and alarming systems within the specified control systems to produce the overall system performance as specified.
- E. Electrical contractor shall provide (1) IP drop for each variable speed motor controller.

3.2 WARRANTY

- A. Manufacturer shall warrant equipment to be free from defects in materials and workmanship for the lesser of one (1) year from date of installation or eighteen (18) months from date of delivery.

END OF SECTION