

PROJECT MANUAL

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION BOILER REPLACEMENT BISMARCK, NORTH DAKOTA

2020

PROJECT NO.: 19590

BID: THURSDAY, FEBRUARY 27, 2020

OWNER:

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
608 EAST BOULEVARD AVENUE
Bismarck, North Dakota 58505



Project Manual For:

North Dakota Department of Transportation
Boiler Replacement
Bismarck, North Dakota
Project No. 19590

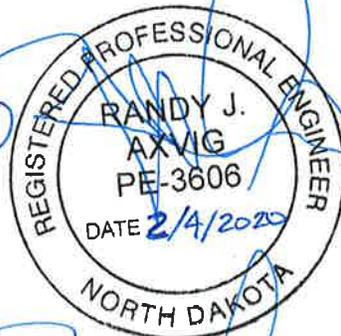
Mechanical & Electrical Engineers:

Prairie Engineering, P.C.
619 Riverwood Drive, Suite 205
Bismarck, North Dakota 58504

Phone: (701) 258-3493

Fax: (701) 258-6857

I hereby certify that this Plan, Specification, or Report was prepared by me or under my direct supervision, and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota.



Randy J. Axvig, P.E.

February 4, 2020

Date

PE-3606

Reg. No.



Jeremy J. Butman, P.E.

February 4, 2020

Date

PE-5943

Reg. No.

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Notice is hereby given to bid on a Mechanical Contract related to the North Dakota Department of Transportation Boiler Replacement project, in Bismarck, North Dakota as described in the Contract Documents as prepared by Prairie Engineering, P.C., Bismarck, North Dakota, Engineer.

General work will consist of incidental work to complete the mechanical and electrical work as described in the Contract Documents.

Mechanical work will consist of the removal of the existing fuel oil supply tanks and boilers and the installation of new boilers, piping, HVAC equipment, and controls as described in the Contract Documents.

Electrical work will consist of incidental work including power disconnection to existing mechanical equipment and new connections to new equipment as described in the Contract Documents. Electrical work also includes miscellaneous items associated with the Mechanical work.

The Engineer will receive sealed Bids, in duplicate, until 12:00 P.M. CDT, Thursday, February 27, 2020, at the office of the Engineer, 619 Riverwood Drive, Suite 205, Bismarck, North Dakota. Proposals received after that time will not be accepted and will be returned to the bidder unopened. Proposals will be opened and publicly read aloud at 1:30 P.M. CDT in the Red River Room located on the ground floor in the State Capitol, 600 East Boulevard Avenue, Bismarck, North Dakota.

Bid documents are available for download on the Prairie Engineering, P.C website at the following link: <http://www.prairieengineeringpc.com/projects-for-bid>. Reproduction costs associated with obtaining the bid documents will be the responsibility of the Contractor bidding the project.

The documents are also on file and open for public inspection at the following Builders Exchanges: Bismarck-Mandan, Construction Plans Exchange-Bismarck, Fargo-Moorhead, Grand Forks, Minot, all in North Dakota; iSqFt Construction Software Technologies in Brooklyn Center, MN; Minnesota Builders Exchange in Minneapolis, MN; Builder's Exchange of Billings, MT; Builders Exchange of Rapid City, SD; and on the North Dakota Department of Transportation website.

A pre-bid "Walk-through" of the project is scheduled for February 11, 2020, convening at the Department of Transportation Office, 608 East Boulevard Ave, Bismarck, ND 58505, Bismarck, North Dakota, at 10:00 A.M., CDT. Attendees are requested to enter the building at the east side main entrance and check in at the reception desk.

The Owner reserves the right to waive any informalities and to accept or reject any or all Bids.

Each Bid must be accompanied by a separate envelope containing a Bidder's Bond in a sum equal to five percent of the full amount of the Bid, executed by the Bidder as Principal and by a Surety Company authorized to do business in this State, conditioned that if the Principal's Bid be accepted and the Contract awarded to the Principal, the Principal, within ten days after notice of award, will execute and effect a Contract in accordance with the terms of the Principal's Bid and a Contractor's Bond as required by law and the regulations and determinations of the governing board.

All Bidders must be licensed for the highest amount of their Bids, as provided by Section 43-07-05 of the ND Century Code.

No Bid will be read or considered which does not fully comply with the above provisions as to Bond and Licenses, and any deficient Bid submitted will be resealed and returned to the Bidder immediately.

No Bidder may withdraw his Bid within 30 days after the actual opening of Bids.

North Dakota Department of Transportation
608 East Boulevard Avenue
Bismarck, North Dakota 58505



Mr. Brad Darr, Maintenance Division Director

Dated this 24th Day of January, 2020

END OF SECTION 001113

1. RECEIPT AND OPENING OF BIDS:

The North Dakota Department of Transportation, hereinafter called the Owner, invites Bids on the form hereto included. All blanks must be appropriately filled in. Bids will be received by the Engineer, at 619 Riverwood Drive, Suite 205, Bismarck, North Dakota, UNTIL 12:00 PM CDT, Thursday, February 27, 2020, and then publicly opened and read aloud at the Red River Room, located on the ground floor in the State Capitol, 600 East Boulevard Avenue, Bismarck, North Dakota. Envelopes containing the Bids must be sealed, addressed to the Owner, and designated as "Bid for Mechanical Construction".

2. SUBMISSION OF BIDS:

Each Bid must be submitted in duplicate on the prescribed form. Each Bid must be submitted in a sealed envelope bearing, on the outside, the Name of the Bidder, his Address, the Name of the Project, the Bidder's State of North Dakota License Class and Number, and the Date on which the License was issued or renewed. The Bid Bond shall be enclosed in a separate envelope affixed to the envelope containing the Bid. Each Contractor shall include a copy of his Contractor's License or Renewal in the envelope containing the Bid Security (Bond).

If forwarded by mail, the sealed envelope containing the Bid must be enclosed in another envelope addressed as specified in the Bid Form. All Bidders must be licensed for the highest amount of their Bids as provided in Section 43-07-12 of the North Dakota Century Code.

3. ADDENDA AND INTERPRETATIONS:

Any and all interpretations and any supplemental instructions will be in the form of written Addenda to the Specification which will be mailed or faxed to all perspective Bidders. Failure of any Bidder to receive any such Addendum or interpretation shall not relieve Bidder from any obligation under his Bid, as submitted. All Addenda so issued shall become a part of the Contract Documents.

4. POWER OF ATTORNEY:

Attorneys-in-fact who sign Bid Bonds or Contract Bonds must file with each Bond a certified and effectively dated copy of their Power of Attorney.

5. BID SECURITY:

Each Bid must be accompanied by a separate envelope containing a Bidder's Bond in a sum equal to five percent of the full amount of the Bid, executed by the Bidder as Principal and by a Surety Company authorized to do business in this State, conditioned that if the Principal's Bid be accepted and the Contract awarded to the Principal, the Principal, within ten days after notice of award, will execute and effect a Contract in accordance with the terms of the Principal's Bid and a Contractor's Bond as required by law and the regulations and determinations of the governing board. A certified or bank check will not be acceptable as Bid Security.

No Bid will be read or considered which does not fully comply with the above provisions as to Bond and Licenses, and any deficient Bid submitted will be resealed and returned to the Bidder immediately.

6. WITHDRAWAL OR MODIFICATION OF BIDS:

Bids may not be modified, withdrawn or canceled by Bidder during stipulated time period following time and date designated for receipt of Bids, and each Bidder so agrees in submitting his Bid. However, prior to time and date designated for receipt of Bids, any Bid submitted may be modified or withdrawn by notice to party receiving Bids at place designated for receipt of Bids. Withdrawn Bids may be resubmitted up to time designated for receipt of Bids provided that they are then fully in conformance with these instructions to Bidders.

Any bidder may modify his bid by Facsimile modification at any time prior to scheduled closing time for receipt of bids, provided such facsimile communication is received by Owner, prior to closing time, and provided further, Owner is satisfied that written confirmation of facsimile communication should not reveal bid price but should provide addition or subtraction or other modification so that final prices or terms will not be known by Owner until the sealed bid is opened. If written confirmation is not received within two days from closing time, no consideration will be given to facsimile modification.

Bid security shall be in amount sufficient for Bid as modified or resubmitted.

7. DEFINED TERMS:

Terms used in these Instructions to Bidders which are defined in the Standard General Conditions of the Construction Contract, EJCDC Document C-700, (2013 edition) have the meanings assigned to them in the General Conditions. The term "Successful Bidder" means the lowest, qualified, responsible Bidder to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award.

8. COPIES OF BIDDING DOCUMENTS:

Complete sets of the Bidding Documents in the number and for the cost, if any, stated in the Advertisement or Invitation may be obtained from Engineer (unless another issuing office is designated in the Advertisement or Invitation to Bid).

Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents. Owner and Engineer is making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

9. QUALIFICATIONS OF BIDDERS:

To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit within five days of Owner's request written evidence of the types set forth in the Supplementary Conditions, such as financial data, previous experience and evidence of authority to conduct business in the jurisdiction where the Project is located. Each Bid must contain evidence of Bidder's qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the contract.

10. EXAMINATION OF CONTRACT DOCUMENTS AND SITE:

Before submitting a Bid, each Bidder must (a) examine the Contract Documents thoroughly, (b) visit the site to familiarize himself with local conditions that may in any way manner affect cost, progress or performance of the Work, (c) familiarize himself with federal, state and local laws, ordinances, rules and regulations that may in any manner affect cost, progress or performance of the Work; and (d) study and carefully correlate Bidder's observations with the Contract Documents.

Reference is made to the Supplementary Conditions for the identification of those reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the Work which have been relied upon by Engineer in preparing the Drawings and Specifications. Owner will make copies of such reports available to any Bidder requesting them. These reports are not guaranteed as to accuracy or completeness, nor are they part of the Contract Documents. Before submitting his Bid each Bidder will, at his own expense, make such additional investigations and tests as the Bidder may deem necessary to determine his Bid for performance of the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

On request Owner will provide each Bidder access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of his Bid.

The lands upon which the Work is to be performed, rights-of-way for access thereto and other lands designated for use by Contractor in performing the Work are identified in the Supplementary Conditions, General Requirements or Drawings.

The submission of a Bid will constitute an incontrovertible representation by the Bidder that he has complied with every requirement of this Article 10 and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

11. INTERPRETATIONS:

All questions about the meaning or intent of the Contract Documents shall be submitted to Engineer in writing. Replies will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than seven days prior to the date for opening of Bids will not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

12. BID SECURITY:

Bid Security shall be made payable to Owner, in an amount of five percent of the Bidder's maximum Bid price and in the form of a Bid Bond issued by a Surety meeting the requirements of paragraph 6.01 of the General Conditions.

The Bid Security of the Successful Bidder will be retained until such Bidder has executed the Agreement and furnished the required Contract Security, whereupon it will be returned; if the successful Bidder fails to execute and deliver the Agreement and furnish the Contract Security within 15 days of the Notice of Award, Owner may annul the Notice of Award and the Bid Security of the Bidder will be forfeited. The Bid Security of any Bidder whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of the seventh day after the "effective date of the Agreement" (which term is defined in the General Conditions) by Owner to Contractor and the required Contract Security is furnished or the Sixty-first day after the Bid opening. Bid Security of other Bidders will be returned within seven days of the Bid opening.

13. CONTRACT TIME:

The number of days within which, or the date by which, the Work is to be completed (the Contract Time) is set forth in the Bid Form and will be included in the Agreement.

14. LIQUIDATED DAMAGES:

Provisions for liquidated damages, if any, are set forth in the Agreement.

15. SUBSTITUTE MATERIAL AND EQUIPMENT:

The Contract, if awarded, will be on the basis of material and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or-equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or-equal" item of material or equipment may be furnished or used by Contractor if acceptable of Engineer, application for such acceptance will not be considered by Engineer until after the "effective date of the Agreement". The procedure for submittal of any such application by Contractor and consideration by Engineer is set forth in paragraphs 7.04 and 7.05 of the General Conditions which may be supplemented in the General Requirements.

16. SUBCONTRACTORS, ETC:

If the Supplementary Conditions require the identity of certain Subcontractors and other persons and organizations to be submitted to Owner in advance of the Notice of Award, the apparent Successful Bidder, and any other Bidder so requested, will within seven days after the day of the Bid opening submit to Owner a list of all Subcontractors and other persons and organizations (including those who are to furnish the principal items of material and equipment) proposed for those portions of the Work as to which such identification is so required. Such list shall be accompanied by an experience statement with pertinent information as to similar projects and other evidence of qualification for each such Subcontractor, person and organization if requested by Owner.

If Owner or Engineer after due investigation has reasonable objection to any proposed Subcontractor, other person or organization, either may before giving the Notice of Award request the apparent Successful Bidder to submit an acceptable substitute without an increase in Bid price. If the apparent Successful Bidder declines to make any such substitution, the contract shall not be awarded to such Bidder, but his declining to make any such substitution will not constitute ground for sacrificing his Bid Security. Any Subcontractor, other person or organization so listed and to whom Owner or Engineer does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer.

In contracts where the Contract Price is on the basis of Cost-of-the-Work Plus a Fee, the apparent Successful Bidder, prior to the Notice of Award, shall identify in writing to Owner those portions of the Work that such Bidder proposes to subcontract and after the Notice of Award may only subcontract other portions of the Work with Owner's written consent.

No Contractor shall be required to employ any Subcontractor, other person or organization against whom he has reasonable objection.

17. BID FORM:

The Bid Form is attached hereto; additional copies may be obtained from Engineer.

Bid Forms must be completed in ink or by typewriter. The Bid price of each item on the form must be stated in words and numerals; in case of a conflict, words will take precedence.

Bids by corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.

All names must be typed or printed below the signature.

The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which shall be filled in on the Bid Form).

The address to which communications regarding the Bid are to be directed must be shown.

18. BIDS TO REMAIN OPEN:

Unless otherwise indicated on the Bid Form, all Bids shall remain open for thirty days after the day of the Bid opening, but Owner may, in his sole discretion, release any Bid and return the Bid Security prior to that date.

19. AWARD OF CONTRACT:

Owner reserves the right to reject any and all Bids, to waive any and all informalities and to negotiate contract terms with the Successful Bidder, and the right to disregard all nonconforming, non-responsive or conditional Bids. Discrepancies between words and figures will be resolved in favor of words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

In evaluating Bids, Owner shall consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, and alternates and unit prices if requested in the Bid forms. It is Owner's intent to accept alternates (if any are accepted) in the order in which they are listed in the Bid form but Owner may accept them in any order or combination.

Owner may consider the qualifications and experiences of Subcontractors and other persons and organizations (including those who are to furnish the principal items of material or equipment) proposed for those portions of the Work as to which the identity of Subcontractors and other persons and organizations must be submitted as provided in the Supplementary Conditions. Operating costs, maintenance considerations, performance data and guarantees of materials and equipment may also be considered by Owner.

Owner may conduct such investigations as he deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of the Bidders, proposed Subcontractors and other persons and organizations to do the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.

Owner reserves the right to reject the Bid of any Bidder who does not pass any such evaluation to Owner's satisfaction.

If the contract is to be awarded it will be awarded to the lowest Bidder whose evaluation by Owner indicates to Owner that the award will be in the best interests of the Project.

If the contract is to be awarded, Owner will give the Successful Bidder a Notice of Award within thirty days after the day of the Bid opening.

20. PERFORMANCE AND OTHER BONDS:

Article 6 of the General Conditions and the Supplementary Conditions set forth Owner's requirements as to performance and other Bonds. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by the required Contract Security.

21. SIGNING OF AGREEMENT:

When Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by at least three unsigned counterparts of the Agreement and all other Contract Documents. Within fifteen days thereafter Contractor shall sign and deliver at least three counterparts of the Agreement to Owner with all other Contract Documents attached. Within ten days thereafter Owner will deliver all fully signed counterparts to Contractor. Engineer will identify those portions of the Contract Documents not fully signed by owner and Contractor and such identification shall be binding on all parties.

END OF SECTION 002113

Bid For: Mechanical Construction

PROPOSAL OF: _____
(Name)

(Address)

To: Mr. Brad Darr, Maintenance Division Director
North Dakota Department of Transportation
608 East Boulevard Avenue
Bismarck, North Dakota 58505

The Bidder having examined the Specifications with related documents, and the site of the proposed work entitled "North Dakota Department of Transportation Boiler Replacement" and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, supplies, and to construct the project, in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required in the Contract Documents, of which this proposal is a part.

Bidder hereby agrees to commence work under this Contract on or before a date to be specified in written "Notice to Proceed" of the Owner with substantial completion by September 1, 2020 and to fully complete the project no later than September 15, 2020. The Bidder acknowledges the receipt of the following Addenda: _____

The undersigned agrees to perform the Work described in the Specifications and Plans for the base bid sum of:

_____ Dollars (\$ _____)

The undersigned agrees to perform the Alternates described in the Specification and Plans for the following cost as a change to the base bid sum stated above:

Alternate 1: Add _____ Dollars (\$ _____)

Alternate 2: Add _____ Dollars (\$ _____)

The Bidder agrees that this Bid shall be good for a period of 30 calendar days after the scheduled closing time for receiving Bids. The Owner reserved the right to waive any informalities and to accept or reject any or all Bids. Enclosed with this Bid is Bid Security in the amount of not less than 5% of the Bidder's proposed Contract Sum. North Dakota Century Code 43-07-12 states that a copy of the License or Certificate or Renewal thereof issued by the Secretary of State must be enclosed in the Bid Bond envelope. A Bid submitted without this information properly enclosed in the Bid Bond envelope shall not be read nor considered and shall be returned to the Bidder.

Respectfully submitted,

By _____

Title _____

Dated this _____ day of _____, 2020

END OF SECTION 004110

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by



Issued and Published Jointly by



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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision

regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.
35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.

38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:*
1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:*
1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).
- E. *Furnish, Install, Perform, Provide:*
1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words

“furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 - 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 - 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

- A. Standards Specifications, Codes, Laws and Regulations
 - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 - 2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

- A. *Reporting Discrepancies:*
 - 1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
 3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.
- B. *Resolving Discrepancies:*
1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 2. abnormal weather conditions;
 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
 4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.
- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

- A. *Limitation on Use of Site and Other Areas:*
 - 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 - 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste

materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

- C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
 - 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
 - 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 - 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
 - 1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
 - 2. is of such a nature as to require a change in the Drawings or Specifications; or
 - 3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Price and Times Adjustments:*
 1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site

and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

- c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.
- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and

recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Price and Times Adjustments:*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
 - d. Contractor gave the notice required in Paragraph 5.05.B.
 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 2. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer,

or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond

signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor

to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

- A. *Workers' Compensation*: Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
 - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
 - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).
 - 4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
 - 1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
 - 2. claims for damages insured by reasonably available personal injury liability coverage.
 - 3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. *Commercial General Liability—Form and Content*: Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
 - 1. Products and completed operations coverage:
 - a. Such insurance shall be maintained for three years after final payment.

- b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Broad form property damage coverage.
 4. Severability of interest.
 5. Underground, explosion, and collapse coverage.
 6. Personal injury coverage.
 7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
 8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. *Contractor's pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.
- G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial

Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

- I. *General provisions:* The policies of insurance required by this Paragraph 6.03 shall:
 1. include at least the specific coverages provided in this Article.
 2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
 3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
 4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
 5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

- A. *Builder's Risk:* Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
 1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."

2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
 3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
 4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).
 5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
 6. extend to cover damage or loss to insured property while in transit.
 7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
 8. allow for the waiver of the insurer's subrogation rights, as set forth below.
 9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
 10. not include a co-insurance clause.
 11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
 12. include performance/hot testing and start-up.
 13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change*: All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this

Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.

- C. *Deductibles*: The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. *Additional Insurance*: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
 - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by,

arising out of, or resulting from fire or other perils whether or not insured by Owner;
and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 *"Or Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

- a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - a. shall certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design,
 - 2) be similar in substance to that specified, and
 - 3) be suited to the same use as that specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from that specified, and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the

Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

- E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.
- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.
- O. Nothing in the Contract Documents:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
 - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the

performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if

any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly

or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

- F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
- G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

- A. *Shop Drawing and Sample Submittal Requirements:*
 - 1. Before submitting a Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
 - 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.
1. *Shop Drawings:*
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.
 2. *Samples:*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review:*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and

Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.

5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal;
 6. the issuance of a notice of acceptability by Engineer;
 7. any inspection, test, or approval by others; or
 8. any correction of defective Work by Owner.
- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or

alter others' work with the written consent of Engineer and the others whose work will be affected.

- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. an itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual

rights against Contractor with respect to the breach of the obligations set forth in this paragraph.

- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.
- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On

the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in

contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
 - 1. *Change Orders:*
 - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
 - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
 - 2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents

governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
 1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).
- C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01.C.2.a and 11.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
 2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
 3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 Execution of Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders covering:
1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
 4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
 - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
 - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal

and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing

Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or

indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee:* When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 Allowances

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

- B. *Cash Allowances*: Contractor agrees that:
 - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 - 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 - 3. by manufacturers of equipment furnished under the Contract Documents;
 - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
 - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
 - 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
 - 3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- C. *Review of Applications:*
 - 1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
 - 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon

Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

- c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due:*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner:*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. the Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. the Contract Price has been reduced by Change Orders;
 - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
 - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - l. there are other items entitling Owner to a set off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
 - 2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

- A. *Application for Payment:*
 - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all disputes that Contractor believes are unsettled; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
 3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. *Engineer's Review of Application and Acceptance:*
1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.
- D. *Payment Becomes Due:* Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such other adjacent areas;
 - 2. correct such defective Work;
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When

exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
 - 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
 - 1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
 - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

The "Standard General Conditions of Construction Contract" Prepared by Engineers Joint Documents Committee, Document No. C-700 (2013 Edition) consisting of 18 Articles and 65 pages is hereby made a part of the Contract Documents.

Articles No. 1 through No. 18 of the Standard General Conditions of the Construction Contract, EJCDC (2013), includes the following modifications referred to as SUPPLEMENTARY CONDITIONS, is hereby incorporated into and made a part of the Contract Documents.

1. Article No. 6.03:

The limits of liability for the insurance required by Paragraph 6.03-I.2 of the General Conditions (including subparagraphs) shall provide coverage for not less than the following amounts or greater where required by law.

Workers' Compensation, etc.:

- | | |
|--|-----------|
| (1) State: | Statutory |
| (2) Applicable Federal
(e.g. Longshoreman's): | Statutory |
| (3) Employer's Liability: | \$100,000 |

Comprehensive General Liability:

- | | |
|----------------------|-----------------|
| (1) Bodily Injury: | |
| \$1,000,000 | Each Occurrence |
| \$1,000,000 | Aggregate |
| (2) Property Damage: | |
| \$1,000,000 | Each Occurrence |
| \$1,000,000 | Aggregate |

Comprehensive Automobile Liability:

- | | |
|----------------------|-----------------|
| (1) Bodily Injury: | |
| \$1,000,000 | Each Person |
| \$1,000,000 | Each Accident |
| (2) Property Damage: | |
| \$1,000,000 | Each Occurrence |

The Contractor has the option of choosing a \$1,000,000 Umbrella Policy.

END OF SECTION 008000

**ADDENDUM to EJCDC®
AGREEMENT BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE) © (2013)**

Project No. _____

This addendum (Addendum) is entered into between the State of North Dakota, Department of Transportation (OWNER or Owner), and _____ (CONTRACTOR or Contractor) to amend the "Agreement Between OWNER and CONTRACTOR for Construction Contract (Stipulated Price)" (EJCDC® C-520) © (2013) (Agreement or Contract). The parties agree to the following terms and conditions and expressly agree that if any of the following terms and conditions are in conflict with any of the terms and conditions of the Agreement, then, notwithstanding any term in the Agreement, the following terms and conditions govern and control the rights and obligations of the parties. Any amendments to the Agreement, this Addendum, or any other amendments, must be in writing and executed by each party.

The following Articles, Sections, Paragraphs, Subparagraphs, Clauses and or Exhibits are amended as follows:

ARTICLE 5 – CONTRACT PRICE:

- **5.01A:** "For all Work other than Unit Price Work, a lump sum of:" is DELETED and replaced with "**For all Work, a lump sum of and not to exceed:**"

ARTICLE 10 - MISCELLANEOUS:

- **10.02 *Assignment of Contract:*** is DELETED in its ENTIRETY and replaced with: "**ASSIGNMENT AND SUBCONTRACTS**

CONTRACTOR may not assign or otherwise transfer or delegate any right or duty without OWNER's express written consent, provided, however, that CONTRACTOR may assign its rights and obligations hereunder in the event of a change of control or sale of all or substantially all of its assets related to this Contract, whether by merger, reorganization, operation of law, or otherwise. Should Assignee be a business or entity with whom OWNER is prohibited from conducting business, OWNER shall have the right to terminate without cause.

CONTRACTOR may enter into subcontracts provided that any subcontract acknowledges the binding nature of this Contract and incorporates this Contract, including any attachments. CONTRACTOR is solely responsible for the performance of any subcontractor with whom CONTRACTOR contracts.

CONTRACTOR does not have authority to contract for or incur obligations on behalf of OWNER.”

- **10.04 Severability:** is DELETED in its ENTIRETY and replaced with: “If any term of this Contract is declared to be illegal or unenforceable by a court having competent jurisdiction, the validity of the remaining terms is unaffected and, if possible, the rights and obligations of the parties are to be construed and enforced as if this Contract did not contain that term.”

The following Supplemental Terms and Conditions are added to the Agreement:

Prepayment

OWNER will not make any advance payments before performance by CONTRACTOR under this Contract.

Payment of Taxes by OWNER

OWNER is not responsible for and will not pay local, state, or federal taxes. OWNER sales tax exemption number is E-2001. OWNER will furnish certificates of exemption upon request by the CONTRACTOR.

Taxpayer ID

CONTRACTOR’S federal employer ID number is: _____ .

TERMINATION

Termination by Mutual Agreement

This Contract may be terminated by mutual consent of both parties executed in writing.

Early Termination in the Public Interest

OWNER is entering into this Contract for the purpose of carrying out the public policy of the State of North Dakota, as determined by its Governor, Legislative Assembly, Agencies and Courts. If this Contract ceases to further the public policy of the State of North Dakota, OWNER, in its sole discretion, by written notice to CONTRACTOR, may terminate this Contract in whole or in part.

Termination for Lack of Funding or Authority

OWNER by written notice to CONTRACTOR, may terminate the whole or any part of this Contract under any of the following conditions:

- 1) If funding from federal, state, or other sources is not obtained and continued at levels sufficient to allow for purchase of the services or supplies in the indicated quantities or term.
- 2) If federal or state laws or rules are modified or interpreted in a way that the services are no longer allowable or appropriate for purchase under this Contract or are no longer eligible for the funding proposed for payments authorized by this Contract.
- 3) If any license, permit, or certificate required by law or rule, or by the terms of this Contract, is for any reason denied, revoked, suspended, or not renewed.

Termination of this Contract under this subsection is without prejudice to any obligations or liabilities of either party already accrued prior to termination.

Termination for Cause.

OWNER may terminate this Contract effective upon delivery of written notice to CONTRACTOR, or any later date stated in the notice:

- 1) If CONTRACTOR fails to provide services required by this Contract within the time specified or any extension agreed to by OWNER; **or**
- 2) If CONTRACTOR fails to perform any of the other provisions of this Contract, or so fails to pursue the work as to endanger performance of this Contract in accordance with its terms.

The rights and remedies of OWNER provided in this subsection are not exclusive and are in addition to any other rights and remedies provided by law or under this Contract.

FORCE MAJEURE

Neither party shall be held responsible for delay or default caused by fire, riot, terrorism, acts of God, or war if the event is beyond the party's reasonable control and the affected party gives notice to the other party promptly upon occurrence of the event causing the delay or default or that is reasonably expected to cause a delay or default.

INDEMNIFICATION

ARCHITECT agrees to defend, indemnify, and hold harmless the state of North Dakota, its agencies, officers and employees (State), from and against claims based on the vicarious liability of State or its agents, but not against claims based on State's contributory negligence, comparative and/or contributory negligence or fault, sole

negligence, or intentional misconduct. This obligation to defend, indemnify, and hold harmless does not extend to professional liability claims arising from professional errors and omissions. The legal defense provided by ARCHITECT to State under this provision must be free of any conflicts of interest, even if retention of separate legal counsel for State is necessary. Any attorney appointed to represent State must first qualify as and be appointed by the North Dakota Attorney General as a Special Assistant Attorney General as required under N.D.C.C. § 54-12-08. Architect also agrees to defend, indemnify, and hold State harmless for all costs, expenses and attorneys' fees incurred if State prevails in an action against Architect in establishing and litigating the indemnification coverage provided herein. This obligation shall continue after the termination of this Contract.

INSURANCE

Architect shall secure and keep in force during the term of this agreement, from insurance companies, government self-insurance pools or government self-retention funds, authorized to do business in North Dakota, the following insurance coverages:

- a. Commercial general liability, including premises or operations, contractual, and products or completed operations coverages (if applicable), with minimum liability limits of \$1,000,000 per occurrence.
- b. Professional errors and omissions, including that "tail coverage endorsement" which is currently carried by Architect, with minimum liability limits of \$1,000,000 per occurrence and in the aggregate. If Architect changes carriers, then such tail coverage endorsement must be for a three year period of time.
- c. Automobile liability, including Owned (if any), Hired, and Non Owned automobiles, with minimum liability limits of \$1,000,000 per occurrence.
- d. Workers compensation coverage meeting all statutory requirements. The policy shall provide coverage for all states of operation that apply to the performance of this contract.
- e. The insurance coverages listed above must meet the following additional requirements:
 - (1) Any deductible or self-insured retention amount or other similar obligation under the policies shall be the sole responsibility of Architect.
 - (2) This insurance may be in policy or policies of insurance, primary and excess, including the so called umbrella or catastrophe form and must be placed with insurers rated "A " or better by A.M. Best Company, Inc., provided any excess policy follows form for coverage. Less than an "A" rating must be approved by State. The policies shall be in form and terms approved by State.

(3) State will be defended, indemnified, and held harmless to the full extent of any coverage actually secured by Architect in excess of the minimum requirements set forth above. The duty to indemnify State under this agreement shall not be limited by the insurance required in this agreement.

(4) State of North Dakota and its agencies, officers, and employees (State) shall be endorsed on the commercial general liability policy, including any excess policies (to the extent applicable), as additional, insured. State shall have all the benefits, rights and coverages of an additional insured under these policies.

(5) The insurance required in this agreement, through a policy or endorsement, shall include:

a) "Waiver of Subrogation" waiving any right to recovery the insurance company may have against State, but excepting coverage under N.D.C.C. Title 65;

b) a provision that Architect's insurance coverage shall be primary (i.e., pay first) as respects any insurance, self-insurance or self-retention maintained by State and that any insurance, self-insurance or self-retention maintained by State shall be in excess of Architect's insurance and shall not contribute with it;

c) cross liability/severability of interest for all policies and endorsements except for professional liability or professional errors and omissions coverage;

d) The legal defense provided to State under the policy and any endorsements must be free of any conflicts of interest, even if retention of separate legal counsel for State is necessary;

e) the insolvency or bankruptcy of the insured Architect shall not release the insurer from payment under the policy, even when such insolvency or bankruptcy prevents the insured Architect from meeting the retention limit under the policy."

(6) Architect shall furnish a certificate of insurance to the undersigned State representative prior to commencement of this agreement. All endorsements shall be provided as soon as practicable.

(7) Failure to provide insurance as required in this agreement is a material breach of contract entitling State to terminate this agreement immediately.

WORKS FOR HIRE

CONTRACTOR acknowledges that all work(s) under this Contract is "work(s) for hire" within the meaning of the United States Copyright Act (Title 17 United States Code) and hereby assigns to OWNER all rights and interests CONTRACTOR may have in the

work(s) it prepares under this Contract, including any right to derivative use of the work(s). All software and related materials developed by CONTRACTOR in performance of this Contract for OWNER shall be the sole property of OWNER, and CONTRACTOR hereby assigns and transfers all its right, title, and interest therein to OWNER. CONTRACTOR shall execute all necessary documents to enable OWNER to protect OWNER's intellectual property rights under this section.

WORK PRODUCT

All work product, equipment or materials created for OWNER or purchased by OWNER under this Contract belong to OWNER and must be immediately delivered to OWNER at OWNER'S request upon termination of this Contract.

NOTICE

All notices or other communications required under this Contract must be given by registered or certified mail and are complete on the date postmarked when addressed to the parties at the following addresses:

OWNER	CONTRACTOR
Name	Name
Title	Title
Address	Address
City, State, Zip	City, State, Zip

Notice provided under this provision does not meet the notice requirements for monetary claims against the State of North Dakota found at N.D.C.C. § 32-12.2-04.

CONFIDENTIALITY

CONTRACTOR shall not use or disclose any information it receives from OWNER under this Contract that OWNER has previously identified as confidential or exempt from mandatory public disclosure except as necessary to carry out the purposes of this Contract or as authorized in advance by OWNER. OWNER shall not disclose any information it receives from CONTRACTOR that CONTRACTOR has previously identified as confidential and that OWNER determines in its sole discretion is protected from mandatory public disclosure under a specific exception to the North Dakota public records law, [N.D.C.C. ch. 44-04](#). The duty of OWNER and CONTRACTOR to maintain confidentiality of information under this section continues beyond the Term of this Contract.

COMPLIANCE WITH PUBLIC RECORDS LAWS

CONTRACTOR understands that, in accordance with this Contract's Confidentiality clause, OWNER must disclose to the public upon request any records it receives from CONTRACTOR. CONTRACTOR further understands that any records obtained or

generated by CONTRACTOR under this Contract, may, under certain circumstances, be open to the public upon request under the North Dakota public records law. CONTRACTOR agrees to contact OWNER promptly upon receiving a request for information under the public records law and to comply with OWNER's instructions on how to respond to the request.

INDEPENDENT ENTITY

CONTRACTOR is an independent entity under this Contract and is not a OWNER employee for any purpose, including the application of the Social Security Act, the Fair Labor Standards Act, the Federal Insurance Contribution Act, the North Dakota Unemployment Compensation Law and the North Dakota Workforce Safety and Insurance Act. CONTRACTOR retains sole and absolute discretion in the manner and means of carrying out CONTRACTOR'S activities and responsibilities under this Contract, except to the extent specified in this Contract.

SPOILIATION – PRESERVATION OF EVIDENCE

CONTRACTOR shall promptly notify OWNER of all potential claims that arise or result from this Contract. CONTRACTOR shall also take all reasonable steps to preserve all physical evidence and information that may be relevant to the circumstances surrounding a potential claim, while maintaining public safety, and grants to OWNER the opportunity to review and inspect such evidence, including the scene of an accident.

MERGER AND MODIFICATION, CONFLICT IN DOCUMENTS

This Addendum together with EJCDC® C-520 (2013), EJCDC® C-700 (2013) and Supplementary Conditions to the EJCDC® C-700 (2013) constitute the entire agreement between the parties. There are no understandings, agreements, or representations, oral or written, not specified within the agreement. The agreement may not be modified, supplemented or amended, in any manner, except by written agreement signed by both parties.

Notwithstanding anything herein to the contrary, in the event of any inconsistency or conflict among the documents making up this Contract, the documents must control in this order of precedence:

- a. The terms of this Addendum as may be amended;
- b. The EJCDC® C-520 (2013);
- c. The EJCDC® C-700 (2013);
- d. Supplementary Conditions to the EJCDC® C-700 (2013).

APPLICABLE LAW AND VENUE

This Contract is governed by and construed in accordance with the laws of the State of North Dakota. Any action to enforce this Contract must be adjudicated exclusively in the

state District Court of Burleigh County, North Dakota. Each party consents to the exclusive jurisdiction of such court and waives any claim of lack of jurisdiction or *forum non conveniens*.

ALTERNATIVE DISPUTE RESOLUTION – JURY TRIAL

By entering into this Contract, OWNER does not agree to binding arbitration, mediation, or any other form of mandatory Alternative Dispute Resolution. The parties may enforce the rights and remedies in judicial proceedings. OWNER does not waive any right to a jury trial.

ATTORNEY FEES

In the event a lawsuit is instituted by OWNER to obtain performance due under this Contract, and OWNER is the prevailing party, CONTRACTOR shall, except when prohibited by N.D.C.C. § 28-26-04, pay OWNER's reasonable attorney fees and costs in connection with the lawsuit.

NONDISCRIMINATION AND COMPLIANCE WITH LAWS

CONTRACTOR agrees to comply with all applicable federal and state laws, rules, and policies, including those relating to nondiscrimination, accessibility and civil rights. (See N.D.C.C. Title 34 – Labor and Employment, specifically N.D.C.C. ch. 34-06.1 Equal Pay for Men and Women.)

CONTRACTOR agrees to timely file all required reports, make required payroll deductions, and timely pay all taxes and premiums owed, including sales and use taxes, unemployment compensation and workers' compensation premiums. CONTRACTOR shall have and keep current at all times during the Term of this Contract all licenses and permits required by law.

CONTRACTOR's failure to comply with this section may be deemed a material breach by CONTRACTOR entitling OWNER to terminate in accordance with the Termination for Cause section of this Contract.

STATE AUDIT

All records, regardless of physical form, and the accounting practices and procedures of CONTRACTOR relevant to this Contract are subject to examination by the North Dakota State Auditor, the Auditor's designee, or Federal auditors, if required. CONTRACTOR shall maintain all of these records for at least three (3) years following completion of this Contract and be able to provide them upon reasonable notice. OWNER, State Auditor, or Auditor's designee shall provide reasonable notice to CONTRACTOR prior to conducting examination.

EFFECTIVENESS OF CONTRACT

This Contract is not effective until fully executed by both parties. If no start date is specified in the Term of Contract, the most recent date of the signatures of the parties shall be deemed the Effective Date.

CONTRACTOR	STATE OF NORTH DAKOTA
	Acting through its
BY:	BY:
Date:	Date:

1. **Coordination** – It shall be the duty of each Contractor to cooperate with the Engineer and all other Contractors engaged in the project. In addition to coordinating the work of the various Contractors, the Contractors shall cooperate with the Owner and his scheduling requirements.
2. **Certificate of Payment** – Certificates of Payment shall be submitted to the Engineer for labor and materials incorporated in the work and for materials suitably stored at the site, less retainage described herein.

Retention on monthly Certificates of Payment shall be as follows:

10% until 50% complete, with no additional retainage on estimates during the continuance of the Contract. When 95% complete, 50% of all retained may be paid to the Contractors, and the balance at the discretion of the Engineer, but immediately upon final acceptance.

3. **Temporary Facility Needs** – The Mechanical contractor shall provide dumpster at a location indicated by the Owner. Temporary supply air and exhaust air in the boiler room will be required during working hours to control odors and smoke in other areas of the building. Equipment and pipe demolition work may proceed during normal working hours, but removal of refuse and equipment shall be outside of normal working hours using a route through the building as indicated by the Owner. Protective floor covering shall be used to protect finished areas.
4. **Preparation for Pipe, Hangers, Etc.** – Each of the Contractors shall make suitable preparation for the installation of all piping, conduit, hangers, inserts, anchors, grounds, supports, etc., that are to be embedded in concrete or masonry walls, floors, partitions, or structural members, or that are to pass through or be attached thereto. Proper sleeves, boxes, receptacles, or chases shall be provided for all openings or recesses occurring in or pass through any of such members, all of which shall be accurately located and firmly secured in place before any such masonry has been erected or concrete poured. Each Contractor shall have men and material on hand so that all his work can be made and all piping, conduits, etc., can be installed and tested before or during the erection of such masonry or pouring of such concrete.
5. **General Guarantee** – Neither the final Certificate of Payment, nor any provision in the Contract Documents, nor partial or entire occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work, resulting therefrom which shall appear within a period of one year from the date of final acceptance of the work unless a longer period is specified. The Owner will give notice of observed defects with reasonable promptness.

6. **Intent of Drawings and Specifications** – Reference must be made to the Drawings for all measurements. The measurements given on the Plans shall be checked by the Contractor before proceeding with work and any discrepancy shall be reported at once to the Engineer. Should it appear that the work intended to be described, or any of the matters relative thereto, are not sufficiently detailed or explained on the Drawings, or in the Specifications, Contractors shall apply to the Engineer for the further Drawings or explanations as may be necessary and shall conform to the same as far as they shall be consistent with original Drawings and in the event of any question, arising with respect to the true meaning of the Drawings and Specifications, reference shall be made to the Engineer, whose decision shall be final and conclusive. In no case shall a Bid be submitted or shall any work proceed with uncertainty. It is the intention of this Specification and the accompanying Drawings to provide a job complete in every respect. Contractors are to be responsible for this result and to turn over the project in complete operating condition irrespective of whether the Plans and Specifications cover every individual item in minute detail.

7. **Cutting and Patching** – This Contractor shall do all cutting and patching of his work required to make its several parts come together properly and fit it to receive or be received by work of other Contractors, shown upon or reasonably implied, by Drawings and Specifications and he shall make good after them as the Engineer may direct.

Any cost caused by defective or ill-timed work shall be borne by the party responsible therefore.

A Contractor shall not endanger any work by cutting, digging, or otherwise and shall not alter the work of any other Contractor without the consent of the Engineer.

Cutting required by other Contractors and not shown on the General Plans shall be done by them; patching shall be done by that Contractor.

8. **Pumping and Bailing** – If, during the progress of the work, water shall be found or water fills the trenches or bottom of the excavations by reason of rain, or any other cause, the same shall be pumped or bailed out by the Contractor and the excavation kept free from water without expense to the Owner until the completion of the work.

9. **Substitutions or “Approved Equal”** –

A. All requests for approval of substitutions of specified items under the “OR APPROVED EQUAL” shall comply with the following:

1. Each request shall be accompanied by literature giving complete information concerning all details of the proposed item.
2. If product catalogs are sent, the item shall be clearly indicated as to the exact item the equal refers to.
3. All approvals will be sent to Specification and Planholders in the form of Addenda well in advance of the Bid Opening time. Requests shall be in the Engineer's hands at least 168 hours (7 Days) prior to the Bid Opening.
4. If the requester wants a reply sent to him, he shall send a stamped, self-addressed envelope or card with the request for approval.

10. **Temporary Utilities** – The Owner will furnish water and electricity for construction.
11. **Temporary Telephone** – Not required this project.

END OF SECTION 011000

1. GENERAL:

- A. The purpose is to allow the Owner to compare cost to assist the Owner's decision prior to awarding the Contract.
- B. The Alternates described are required to be reflected on the Bid Form. Do not submit any Alternates not described.

2. ALTERNATE NO. 1 (ADD):

- A. The Owner wishes to know in advance the possible cost to furnish and install a larger electric boiler where shown and as scheduled on the Drawings.
- B. Base Bid: Provide and install 270 kW electric boiler, circulating pump, pipe accessories, wiring, and temperature controls as shown and described in the Drawings and Specifications.
- C. Under Alternate No. 1 on the Bid Form, state the Contract Sum to furnish and install a 480 kW electric boiler, circulating pump, pipe accessories, wiring, and temperature controls as shown and described in the Drawings and Specifications.

3. ALTERNATE NO. 2 (ADD):

- A. The Owner wishes to know in advance the possible cost to furnish and install all new system pipe with welded fittings in lieu of grooved or pressed fittings.
- B. Base Bid: Provide and install all hydronic heating system piping with grooved or pressed fittings.
- C. Under Alternate No. 2 on the Bid Form, state the Contract Sum to provide and install all hydronic heating system piping with welded fittings.

END OF SECTION 012300

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
BOILER REPLACEMENT
BISMARCK, NORTH DAKOTA
COMMISSION NO. 19590

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

SECTION 230500	HVAC GENERAL PROVISIONS
SECTION 230510	COMMON WORK RESULTS FOR HVAC
SECTION 230520	GENERAL MOTOR REQUIREMENTS
SECTION 230530	EXCAVATION AND BACKFILL
SECTION 230590	TESTING ADJUSTING AND BALANCING
SECTION 230700	HVAC INSULATION
SECTION 230900	HVAC DDC CONTROLS
SECTION 230980	HVAC SEQUENCE OF OPERATIONS
SECTION 231300	FUEL TANKS
SECTION 232000	HVAC PIPING
SECTION 232100	HYDRONIC SYSTEMS
SECTION 232200	HYDRONIC PUMPS AND SPECIALTIES
SECTION 233000	AIR DISTRIBUTION
SECTION 235000	CENTRAL HEATING EQUIPMENT
SECTION 235700	HEAT EXCHANGERS FOR HVAC
SECTION 238000	DECENTRALIZED HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Specification Format

1. These Specifications are written in imperative and abbreviated form. This imperative language of the technical sections is directed at the Contractors, unless specifically noted otherwise. Incomplete sentences shall be completed by inserting "shall", "the Contractor shall", and "shall be", and similar mandatory phrases by inference in the same manner as they are applied to notes on the Drawings. The words "shall be" shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, perform all indicated requirements whether stated imperatively or otherwise.
2. Three Part Format
 - a. "Part 1 - General": Covers those areas which relate to the Work, and which define the general administrative and technical requirements specific to a particular section.
 - b. "Part 2 - Products": Defines, in detail, the acceptance equipment and materials to be incorporated into the Work.
 - c. "Part 3 - Execution": Describes, in detail, the manner in which items covered by Part 2 are to be incorporated into the Work.
3. Where Codes, Specifications and Drawings are in conflict, the Contractor will be deemed to have bid the more expensive method. Refer all such discrepancies immediately to the Engineer prior to commencing related work.

B. Definitions:

1. Furnish: Supply equipment as required by these Drawings and Specifications, delivered to the job site for installation or use by others.
2. Install: Fix in position for total operational use all apparatus as shown, specified or required. Provide all miscellaneous fittings and wiring supplies.
3. Or Approved Equal: Equipment or materials selected by Contractor subject to Engineer's acceptance.
4. Or Equivalent: Equipment or materials selected by Contractor matching the function and performance of equipment or materials listed.
5. Provide: Furnish and install in place, total and operational.

1.2 SCOPE OF WORK

- A. The work covered by this Division consists in furnishing all labor, equipment, accessories and materials and in performing all operations necessary for the installation of the HVAC systems, in strict accordance with Division 23 of this Specification and applicable Drawings and subject to the terms and conditions of the Contract.
- B. Work of this Division is subject to requirements of Instructions to Bidders, General Conditions, Supplementary Conditions, Division One, and all other sections of this Specification.

- C. Examine site and all Contract documents prior to submittal of bid.
 - 1. Submittal of a Bid shall indicate the Contractor has examined the Site and Drawings and has included all required allowances in this Bid. No allowance shall be made for errors resulting from the Contractor's failure to visit job sites and to review Drawings.
- D. Division 23 Work: Includes, but is not limited to, providing the following:
 - 1. Fuel Oil System: Tanks, piping, accessories.
 - 2. Hydronic Heating System: Piping, plant equipment, fuel supply, heating equipment.
 - 3. Ventilation System: Equipment and ductwork.
 - 4. Building Automation System.
 - 5. Insulation System: Ductwork and piping.

1.3 ALTERNATES

- A. Refer to Section 012300.

1.4 SUBMITTALS

- A. General:

- 1. Preferred Submittal Format: PDF, unless otherwise noted.
- 2. Distribution: Unless otherwise noted, direct all correspondence concerning Division 23 submittals to:

Bryan K. Bartnick
619 Riverwood Drive, Suite 205
Bismarck, ND 58504
bbartnick@prairieengineeringpc.com

- B. Substitution and Prior Approval to Quote:

- 1. Format and Content: Complete descriptive technical data on the proposed item consisting of model numbers, type, size and performance characteristics.
- 2. Submission Timing: Minimum of 192 hours (eight days) prior to bid opening.
 - a. Substitutions will not be permitted after bid opening except where such substitution is considered by the Engineer to be in the best interest of the Owner.
- 3. Bidder Notification: Prior to bid opening via Addenda, sent to all planholders.
- 4. Contractor Responsibility: Coordination with other trades as required to compensate for changes of physical dimensions, electrical requirements, or other changes from the Design; and additional costs and work required by Contractor or any other trades.
- 5. Alternative Format: Printed paper, two copies; Self-addressed, stamped envelope required for return reply.

- C. Schedule of Values

- 1. Distribution: One copy to Engineer.
- 2. Format and Content: When included with the Bid, at minimum the following categories shall be indicated:
 - a. "Project mobilization"
 - b. "Start-up and Commissioning"
 - c. "Demolition"
 - d. "Excavation and Backfill"

- e. "Insulation"
 - f. "Test and Balance"
 - g. "Building Automation System"
 - h. "Piping Systems" (all system/gas piping, valves, fittings, hangers, installed in place)
 - i. "Sheet Metal" (all ductwork, lining, dampers, hangers, installed in place)
 - j. "Hydronic Distribution Equipment" (all pumps, boilers, heating/cooling coils, installed in place)
 - k. "Air Distribution Equipment" (all fans, installed in place)
3. Submission Timing: Prior to first payment application.
- D. Shop Drawings
1. Distribution: Engineer via the Prime Contractor for each item indicated.
 2. Format and Content: Include catalog numbers, performance data, dimensions and other descriptive information.
 - a. Contractor Review: Dated and signed cover sheet or review stamp for each Shop Drawing file to indicate thorough review. **Email message text not acceptable.**
 - b. Submit a separate shop drawing file for each Specification Section including only the items within that Section.
 - c. Non-Conforming: Returned to Contractor without review.
 3. Submission Timing: Prior to delivery of materials to job site.
 4. Alternative Format: Printed catalog sheets (Minimum eight copies).
 5. One copy will be retained by Engineer after review and balance will be returned to Prime Contractor.
- E. Record Drawings
1. Format and Content: Paper copy of Drawings project site.
 - a. As work progresses, Contractor's field supervisor shall mark Record Drawings in red pencil to indicate actual conditions of installation.
 - b. Give particular attention to marking actual locations of underground piping.
 - c. Affix all addendum and change order descriptions to appropriate record drawing sheet, utilizing spray adhesive.
 - d. Make Record Drawings available to Engineer during project visitation.
 2. Submission Timing: Close of project with Record Manuals.
- F. Spare Equipment and Devices
1. Distribution: Owner.
 2. Format and Content: List quantities on contractor letterhead or invoice, obtain signature of Owner's representative acknowledging receipt, and include with each Record Manual.
 3. Submission Timing: Close of project with Record Manuals.
- G. Operation and Maintenance Manuals
1. Submission Timing: Close of project, as condition of its acceptance.
 2. Record Manual information shall be included for all equipment/material where Shop Drawings are required.

3. Format and Content: Two copies, Loose-leaf hardcover binders, **and** in PDF format on CDs.
 - a. List project name, date, Contractor's name, address and telephone number on exterior label of each Record Manual and CD.
 - b. Include an index sheet indicating subcontractor and subcontractor's phone number; and each major piece of equipment, supplier and supplier's telephone number. Provide tabbed dividers indicating major groupings of equipment.
 - c. Include a copy of the Shop Drawings.
 - d. Include all installation, operation and maintenance data packaged with any equipment.

1.5 APPLICATIONS FOR PAYMENT

- A. Refer to Division 1 "Applications for Payment".
- B. Provide one additional copy, sent directly to the Engineer.
- C. Schedule of Values: At minimum, include items in Submittal article.

1.6 CHANGES TO CONTRACT

- A. Any required changes to the contract after bid date shall be in accordance with General Conditions/Division 1 and this section. Where any discrepancies between the sections are encountered, the more restrictive section shall apply.
- B. Proposed changes shall be accompanied with complete substantiating documentation.
 1. Provide an itemized list of quantities for materials, equipment, and supplies.
 - a. Include unit costs for each item and extended price.
 - b. Include unit labor for each item and extended time.
 2. Provide subcontractor proposals that include the same substantiating documentation.
 3. Provide quotations from suppliers for any specially ordered equipment.
- C. Material costs shall be actual costs to the contractor, obtaining the materials through normal supply channels, including trade and quantity discounts. Utilizing "suggested pricing" from national pricing organizations for unit costs shall not be accepted. Upon request, the contractor or subcontractor shall submit evidence to substantiate the costs.
- D. Labor units shall be industry accepted standard labor hours to perform one unit of work. If the work is being performed in a location that is not considered to be standard working conditions for that specific task, additional labor shall be itemized.
- E. Labor rates shall be the actual rate paid for the workman category along with associated labor burden. Labor burden shall consist only of the mandatory fringe benefits, labor taxes, and labor insurances as affected by payroll. The owner reserves the right to reject any labor burden which is inconsistent with other similar contractors or where the fringe benefit cost is in excess of established labor agreements.
- F. Allowable markups for contractor and subcontractors
 1. Overhead on work performed by own forces: 12% maximum.
 2. Profit on work performed by own forces: 10% maximum.
 3. Commission on work performed by Subcontractors: 5% maximum.
 4. Sales tax.

5. Bond and permit increases where applicable.
- G. No additional markups shall be allowed for:
 1. Field and/or office supervision/administration time.
 2. Tool burden.
 3. Shop burden.
 4. Overhead/Profit applied to work performed by others.
- H. Additional costs for travel and subsistence shall only be allowed if the proposal includes a request for extension of the completion date. Furthermore, those costs shall be proportional to the number of working days of the extension.
- I. Subcontractors shall compute their costs in the same manner as the contractor. Subcontractors are subject to the same markup constraints as described herein.
- J. For changes resulting in credit to the costs, no restocking fees for materials shall be applied by the contractor or subcontractors.

1.7 QUALITY ASSURANCE

- A. Qualifications of Installers
 1. For installation and testing, use only trained licensed and experienced workmen familiar with items required and manufacturer's recommended methods.
 2. In acceptance or rejection of installed work, no allowance will be made for lack of skill on the part of the workmen.

1.8 AUTHORITIES AND AGENCIES

- A. Materials, workmanship and installation: comply with the latest editions of all applicable codes, local ordinances, industry standards, utility company regulations, insurance carrier requirements and these Specifications.
- B. Obtain and pay all permits, inspections, licenses and other charges pertaining to the Work. Upon completion of the Work, furnish proof of acceptance by proper agency having jurisdiction.
- C. Codes and standards shall include, but not necessarily be limited to, the following:
 1. International Energy Conservation Code (IECC);
 2. Uniform Plumbing Code;
 3. North Dakota State Building Code;
 4. International Building Code (IBC);
 5. International Mechanical Code (IMC);
 6. International Fuel Gas Code (IFC);
 7. National Fire Protection Association (NFPA) – Sections as adopted by authority having jurisdiction.

- D. The more stringent provisions shall govern where provisions of pertinent codes and standards conflict with these Specifications or Drawings. Where Codes, Specifications or Drawings differ with one another, the Contractor will be deemed to have bid the more expensive method. Refer all such discrepancies to the Engineer immediately.
 - 1. Pertinent codes and standards shall not be cited to furnish less than specifically shown or specified.
 - 2. Meeting the minimum standards of the above Codes does not permit a lower grade of construction where Plans or Specifications call for workmanship or materials in excess of Code Requirements.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.9 GUARANTEE AND WARRANTY

- A. Except where otherwise noted, contractor shall guarantee materials, workmanship and the proper operation of equipment for a period of one year after Owner's beneficial use of the building or mechanical system. Contractor shall correct all equipment, material and workmanship found to be defective or non-conforming to the contract documents without cost to Owner during that one year period.
- B. Guarantee shall include trips to the project site by Contractor to adjust mechanical equipment as required, ensuring it is operating as intended.
- C. Specified guarantee shall not relieve Contractor from liability arising from improper installation or non-compliance with applicable codes.

1.10 TEMPORARY FACILITIES

- A. Refer to Special Conditions and/or Division 1 for details of temporary facilities.

1.11 NOMENCLATURE

- A. Pipe sizes listed are nominal pipe sizes throughout this Division except where otherwise noted.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Material and equipment shall be as shown or specified. Provide material not specifically described but required for a complete and proper installation of the Work, subject to the acceptance of the Engineer.
- B. Owner will not be liable for material installed in non-compliance with codes, standards, and these Contract Documents.
- C. Fire Stop System material shall be by 3M "Fire Barrier", Metacaulk, Hilti, Nelson Firestop Products, or AD Fire.

2.2 ELECTRIC WIRING

- A. The Division 23 Contractor shall furnish all motors, special controls and electrical devices as specified herein for proper operation of the equipment furnished.

- B. Division 26 Contractor shall furnish and install, as required, disconnects, starters, switches, etc., and do all necessary power and control wiring including the installation of electrical devices such as thermostats, humidistats, remote control panels, etc., furnished separately by Division 23 Contractor, unless otherwise noted in Equipment Specifications or noted in Section 230900.

PART 3 - EXECUTION

3.1 GENERAL

- A. Engineer, Architect, or Owner shall not be responsible for the means, methods, techniques, sequences or procedures of construction selected by Contractor.
- B. Engineer, Architect, or Owner shall not be responsible for safety precautions and programs incidental to work of Contractor.
- C. It is the sole responsibility of Contractor to initiate, maintain, and supervise all safety precautions and programs in connection with the Work.
- D. In general, it is intended that ductwork and piping be installed parallel to building lines, unless otherwise shown on the Drawings, and that equipment be located symmetrical with the architectural elements of the building.

3.2 SURFACE CONDITIONS

- A. Prior to work of each Section of Division 23, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- B. Verify that work of this Division may be installed in accordance with all pertinent codes, regulations and standards.

3.3 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Division before, during and after installation and to protect the installed work and materials of all other trades.
- B. Plugs: Install in ends of uncompleted piping at end of each day or when work stops.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

3.4 COORDINATION

- A. Order equipment and material in a timely fashion to assure it is on the job site when required.
- B. Coordinate installation of material with schedule of other trades to prevent unnecessary delay in construction schedule.
- C. Division 23 piping, duct and equipment installations shall comply with National Electrical Code requirements 110.26 "working spaces" and "dedicated spaces". Mechanical ducts and pipes shall not be installed in the space near electrical panels/equipment defined as "working spaces" or "dedicated spaces".

3.5 DISCREPANCIES, CONSTRUCTION CONFLICTS AND DRAWINGS

A. Discrepancies

1. Prior to submitting bid, Contractor shall refer any apparent discrepancies or omissions to Engineer for clarification.
2. The Architect, Engineer or Owner will not be responsible for any oral instructions or modifications to the contract documents prior to opening of bids.
3. Written interpretation or clarification will be made by Addenda.

B. Construction Conflicts

1. Conflicts discovered during construction shall be immediately called to the attention of the Engineer for decision.
2. Do not proceed with installation in area of question until conflict has been fully resolved.
3. When so directed by Engineer, Contractor shall make minor adjustment to avoid interferences with other trades. Such minor adjustments shall be performed at no additional cost to the Architect, Engineer or Owner.

C. Drawings

1. Drawings indicate extent and general layout of mechanical systems for project. Due to small scale, it is not possible to indicate all fittings and accessories that may be required. Provide such fittings and accessories as required to form a complete and operating system in general conformance with Specifications and Drawings.
2. Exact locations, distances, levels and other conditions will be governed by the structure. Field measurements shall take precedence over the Drawings. Use the Drawings and these Specifications for guidance. Secure the Architect's approval for all changes in locations.
3. Verify all measurements at site. No compensation will be made because of difference between locations shown on the Drawings and measurements at the building.
4. Refer to the architectural drawings for dimensions and locations of walls, partitions, doors, windows, ceiling heights, door swings and other details of construction.

3.6 UNDERGROUND UTILITIES

- A. Locations of existing underground utilities are based on available site information and are shown approximately. Contractor shall determine exact utility locations before commencing work and shall be responsible for repair of damages resulting from his construction activities to pre-construction condition.
- B. Excavate and backfill for tank removal to shown or required. Remove any accumulated water in excavation by pumping. Shore and brace excavation as required by safety regulations. Provide temporary bridges to maintain normal traffic flow. Excavation and backfill required by mechanical installations shall be accomplished in accordance with Section 230530 of the Specifications by this Contractor.

3.7 REMOVAL AND/OR REUSE OF EXISTING MATERIALS AND EQUIPMENT

- A. Existing equipment, which is indicated as being removed and not indicated for reuse, shall remain the property of the Owner, stored as directed. Any material the Owner does not wish to retain shall be removed and disposed by the Contractor.

- B. Contractor shall assume in his Bid that existing equipment and materials shown to be reused are in good working condition and can be installed without any repairs. If certain items are found to be in need of repair or in unusable condition, Contractor shall notify the Engineer for decision, however, Contractor shall be responsible for any damage by his personnel to equipment in removal or handling.
- C. Material and other equipment removed and to be reused shall be cleaned before reinstallation.

3.8 OFFSETS

- A. Where required to allow clearance of electrical conduit and outlet boxes, beams, etc., to avoid interference with work of other trades, to increase head room under mechanical systems or to improve the appearance of mechanical systems work, this Contractor shall offset his mechanical system as directed by the Architect/Engineer.

3.9 CUTTING AND PATCHING

- A. Refer to General Conditions. Unless specifically called out to be performed by other Contractors, the Division 23 Contractor shall perform all cutting and patching required for the installation of material and equipment furnished under his Contract.
- B. Opening/holes cut to allow passage of ducts and pipes through concrete floor shall be patched by the Contractor doing the cutting unless indicated otherwise on the Drawings.
- C. Pipe penetrations through fire rated walls and floors shall be sealed with a UL classified Fire Stop System. Fire Stops shall be provided in accordance with the appropriate System No. as it relates to pipe size/Material and wall or floor rating/material.
- D. Openings between ductwork and fire rated walls and floors shall be sealed with fire rated caulking or steel collars on both sides of wall or floor.
- E. Restore damaged surfaces to their original condition by skilled mechanics of the trade involved. Contractor at fault shall assume all cost.
- F. Use only rotary type drilling tools to cut concrete.
- G. Do not endanger the stability of the structure. Do not at any time cut or alter work of any other Contractor without Architect's consent.

3.10 FIELD QUALITY CONTROL

- A. Perform field tests and inspections. Test new piping and parts of existing piping that have been altered, extended, or repaired.
- B. Low Pressure Hydronic Piping Tests: Maintain constant pressure.
 - 1. Pressure: Minimum of 100 psig.
 - 2. Duration: One hour.
- C. Gas Piping Tests:
 - 1. Test gas piping as required by the Authority Having Jurisdiction or the Utility Company.
 - 2. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

- D. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained. Piping will be considered defective if it does not pass tests and inspections.

3.11 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.12 CLEANING

- A. Clean interior of duct and piping systems. Remove dirt and debris as work progresses.
- B. The hydronic water systems shall be cleaned as follows:
 - 1. Division 23 Contractor shall utilize Garrett-Callahan Formula 247 to degrease, descale and generally clean the piping according to the recommendations of the company specialist. After completion of this work, the Contractor shall add the proper quantity of Garrett-Callahan Formula 12L corrosion inhibitor or provide a Nitrite residual of 500-1000 ppm. Equivalent products by Chemsearch, Dearborn, Brentag, or Agassiz Chemical are acceptable.
 - 2. During this project, the Owner plans to drain and clean the building piping system. It is the responsibility of this contractor to clean all newly installed piping and equipment.

3.13 INSTRUCTIONS

- A. Provide written and oral operating and maintenance instructions to Owner's representatives. The oral instructions shall be given before the Owner occupies the buildings. Instructions to include **all** building's mechanical systems and equipment.
- B. Copies of written operating and maintenance instructions shall be included with each Record Manual.
- C. Division 23 Contractor shall coordinate with Owner at Owner's convenience, formal instruction time for contractor personnel to instruct Owner's Representatives on all equipment. Provide similar equipment supplier's instructions where specified thus.
- D. Formal instructions shall be video recorded when required by other Sections of this Specification by this Contractor. Format shall be DVD. Formal instruction to be included with each Record Manual, being referenced to and a part of the Manual.

3.14 CLEAN UP

- A. Each Contractor shall be responsible for cleaning up after his work, including the removal of all scrap material left on the job by his men or Subcontractors. This will include the removal of all pipe and sheet metal cuttings, pieces of sheet metal, pipe, and insulation and other debris.

- B. Clean all heating units, clean and straighten fins on all coils, clean scale, dirt or debris off piping, motors, etc., oil or grease all motors, fan bearings, pump gear boxes, etc., and leave in a clean best possible working condition. Install clean filters in ventilation system prior to turning job over to Owner.
- C. After all tests have been made and the mechanical systems are operating properly, this Contractor shall go over the entire system and remove labels from all mechanical equipment.
- D. All equipment having finished paint surfaces shall be examined upon completion for scratches and other damage. Touch up all surfaces as required with paint of color to match factory finish.
- E. Perform all cleaning as required by other Sections of Division 23.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Ball valves.
 - 2. Butterfly valves.
 - 3. Check valves.
 - 4. Flexible Connectors.
 - 5. Hangers.
 - 6. Escutcheons.
 - 7. Equipment and Warning labels.
 - 8. Pipe labels.
- B. Nomenclature:
 - 1. SWP: Steam working pressure.
 - 2. CWP: Cold working pressure.

1.2 SUBMITTALS

- A. Shop Drawings: For equipment covered under this section as per Section 230500.
 - 1. Product Data: Each type of valve, gauge, strainer, sleeve, and sleeve-seal system.
- B. Operation and Maintenance Data: To include in operation and maintenance manuals as per Section 230500.

PART 2 - PRODUCTS

2.1 VALVE MANUFACTURERS

- A. Except in other Part 2 articles where noted, the following manufacturers are acceptable:
 - 1. Anvil International.
 - 2. Conbraco Industries, Inc.; Apollo Valves.
 - 3. Milwaukee Valve Company.
 - 4. Nexus Valve.
 - 5. NIBCO INC.
 - 6. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- B. All manufacturers are subject to compliance with requirements
- C. Provide products by one of the manufacturers specified or by prior approval.

2.2 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
 - 1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

2. Butterfly Valves: With extended neck.

2.3 BALL VALVES

A. Two-Piece, Metal, Ball Valves:

1. Basis of Design: Apollo Valves 70-100 Series.
2. Standard and Rating: MSS SP-110; 150 psi SWP, 600 psi CWP at 500°F.
3. Body Design: Two piece, forged brass or bronze; PTFE or TFE seats.
4. Stem: Brass or Bronze, blowout-proof, packing nut.
5. Ball: Chrome-plated brass, full or regular port.
6. Operator: Lever; separate lever nut.

2.4 BUTTERFLY VALVES

A. Iron, Single Flange Butterfly Valves:

1. Basis of Design: Nibco LD 2000
2. Standard and Rating: MSS SP-67, 200 psig, 5°F to 250°F.
3. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange; extended neck.
4. Body Material: Epoxy coated; ASTM A 126, cast iron or ASTM A 536, ductile iron; EPDM seat.
5. Stem: One- or two-piece stainless steel.
6. Disc: Aluminum bronze.
7. Operator: Lockable handle for 5" and smaller, gear for 6" and larger.

2.5 CHECK VALVES

A. Check Valve – Bronze Swing:

1. Basis of Design: Nibco T-413-B, threaded end; Nibco S-413-B, solder end.
2. Standard and Rating: MSS SP-80; 200 psig CWP; 350°F.
3. Body Material and Design: ASTM B 62, bronze; Y-pattern body; bronze disc.

B. Check Valve – Iron Silent:

1. Basis of Design: Nibco W-910-B, wafer style; Nibco F-910-B, flanged globe style.
2. Standard and Rating: MSS SP-125; 200 psi CWP, 200°F.
3. Body Design: Horizontal inline with sliding disc.
4. Body Material: ASTM A 126, gray iron.
5. Actuator: Stainless steel spring.
6. Seat and Disc: ASTM B584 Cast bronze.

2.6 SAFETY RELIEF VALVE

A. Description: ASME Section IV water pressure relief valves.

B. Basis of Design: Kunkle Model 537.

C. Description: ASME Section IV, low pressure steam and hot water boilers, "HV" National Board certified safety relief valve, rated for maximum 160 psig and 250 °F.

D. National Board Certification: "HV".

- E. Body Design: Spring loaded with adjusting ring and lever.
 - 1. Seat: ASTM B584 bronze.
 - 2. Spring and stem: Stainless steel.
 - 3. Isolating Diaphragm: BUNA-N/Nylon
 - 4. Set Pressure: 65 psig.
- F. Body Material:
 - 1. 1" and Smaller: ASTM B584 bronze.
 - 2. 1-1/2" and 2": ASTM A126 cast iron.

2.7 CHAINWHEELS

- A. Description: Valve actuation assembly with sprocket rim, brackets, and chain.
 - 1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
 - 2. Attachment: For connection to butterfly valve stems.
 - 3. Sprocket Rim with Chain Guides: Ductile iron, of type and size required for valve.
 - 4. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

2.8 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 - 1. Flexicraft Industries.
 - 2. Keflex; Flex-Weld Incorporated.
 - 3. Mason-Mercer.
 - 4. Metraflex Company.
 - 5. Minnesota Flexible Corp. (MFC).
 - 6. Thermo Tech Inc.
 - 7. Twin City Hose.
- B. Body: Stainless-steel bellows with woven, flexible, stainless steel or bronze, wire-reinforcing protective jacket rated for 150 psig maximum operating pressure and 250 °F maximum operating temperature.
- C. End Connections: Threaded or flanged to match equipment connected.
- D. Performance: Capable of 3/4-inch misalignment.

2.9 PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: Clevis type with locknut to threaded extension rod, factory-fabricated components; MSS SP-58 types 1 through 58.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized or cadmium plated steel.

B. Copper Pipe Hangers:

1. Description: Clevis type with locknut to threaded extension rod, copper-coated-steel, factory-fabricated components; MSS SP-58 types 1 through 58.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel.

C. Trapeze Pipe Hangers:

1. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.10 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier for cold piping.
- B. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- C. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

2.11 DUCT HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Strap and Rod Sizes: 1", 16 gauge straps; 3/8" rod.
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- D. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

2.12 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.13 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

2.14 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

2.15 EQUIPMENT AND WARNING LABELS

A. General Requirements

1. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

2. Minimum Letter Size: 1/2 inch for name of units. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 3. Fasteners: Stainless-steel rivets or self-tapping screws.
 4. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Metal Labels for Equipment:
1. Material and Thickness: Non-corroding metal, 20 gauge minimum thickness, and having predrilled or stamped holes for attachment hardware.
- C. Plastic Labels for Equipment and Warning:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
 2. Equipment Label Color: Black letters on white background.
 3. Warning Label Color: White letters on red background.
 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- D. Warning Label Content: Include caution and warning information, plus emergency notification instructions.
- E. Equipment Label Content: Include equipment's Drawing designation or unique equipment number.
- F. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing plan numbers where equipment is indicated, plus the Specification Section number and title where equipment is specified. Equipment schedule shall be provided to the Controls Contractor and included in operation and maintenance data.

2.16 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 2. Lettering Size: At least 1-1/2 inches high.
- E. As a part of this project, this contractor shall re-label ALL hot water heating piping in the boiler room. All piping currently labeled "Heat Pump Supply" shall be re-labeled "Hot Water Supply" and all piping currently labeled "Heat Pump Return" shall be re-labeled "Hot Water Return."

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.
- B. Install valves in horizontal piping with stem at or above center of pipe in position to allow full stem movement.
- C. Install chainwheels on operators for valves 4" and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.
- D. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing or copper connector.
- E. Install natural gas regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball, or butterfly valves.
 - 2. Throttling Service: Ball or butterfly valves.
 - 3. Pump-Discharge Check Valves:
 - a. 2" and Smaller: Bronze swing check valves with bronze disc.
 - b. 2-1/2" and Larger: Iron silent check valves with rubber seats.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Copper Tubing and Steel Piping, 2" and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing and Steel Piping, 2-1/2" and Larger: Flanged ends.
- D. In general, ball valves are preferred over gate and globe valves on piping 2" and smaller.

3.3 PIPE HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Arrange for grouping of parallel runs of horizontal piping, and support together on trapeze pipe hangers.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

- F. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- G. Install lateral bracing with pipe hangers and supports to prevent swaying.
- H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- I. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe 4" and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe 4" and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. 4" and smaller: 12 inches long and 0.06 inch thick.
 - b. 5" and larger: 18 inches long and 0.06 inch thick.
 - 5. Pipes 8" and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
 - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.
- J. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- K. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- L. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- M. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- N. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- O. Use thermal-hanger shield inserts for insulated piping and tubing.
- P. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 - 2. Steel Clevises (MSS Type 14): For 120 to 450 °F piping installations.

- Q. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20 or 25): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod.
- R. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- S. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
- T. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

3.4 DUCT HANGER AND SUPPORT INSTALLATION

- A. Hanger Spacing: Maximum of 10 feet apart:
1. Rectangular Duct: Pair of straps or rods.
 2. Round Duct, up to 36" diameter: Single rod.
 3. Round Duct, greater than 36" diameter: Double rods or straps.
- B. Install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- C. Hangers Exposed to View: Threaded rod and angle or channel supports.
- D. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

3.5 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.6 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.7 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run.

3.8 VALVE SCHEDULE

- A. Pipe 2" and Smaller:
 - 1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Ball Valves.
 - 3. Check Valves: Bronze swing.
- B. Pipe 2-1/2" and Larger:
 - 1. Butterfly Valves.
 - 2. Check Valves: Iron Silent.
- C. Gas Valves:
 - 1. Ball Valves.

3.9 ESCUTCHEON AND FLOOR PLATE INSTALLATION

- A. Install escutcheons for exposed piping penetrations of walls, ceilings, and floors of finished areas.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

- C. Replace broken and damaged escutcheons using new materials.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Common motor requirements for HVAC equipment.
 - a. General requirements for motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.
2. Single-phase motors.
3. Three-phase motors.

1.2 SUBMITTALS

- A. Product Data: Submit catalog data for each motor furnished loose. Indicate nameplate data, standard compliance, electrical ratings and characteristics, and physical dimensions, weights, mechanical performance data, and support points.

1.3 WARRANTY

- A. Motor performance shall be warranted against material and workmanship defects by manufacturer's warranty and service policy for the period of at least 18 months from the day of shipment from the factory or the manufacturer's warehouse.
1. Premium efficiency motors shall be warranted for 36 months.
 2. Severe duty motors (as applicable) shall be warranted for 60 months.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Motor Characteristics:
1. Duty: Continuous duty at ambient temperature of 105 °F and at altitude of 3500 feet above sea level.
 2. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.2 SINGLE PHASE MOTORS

- A. Description: Single phase motor, T-Frame, 1.25 service factor, minimum class B insulation for 105°F ambient.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
1. Baldor.
 2. Reliance.

3. Siemens-Allis.
 4. General Electric.
 5. Marathon.
 6. Century.
- C. Motors 1/20 HP and Smaller: Shaded-pole type.
- D. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
1. Permanent-split capacitor.
 2. Split phase.
 3. Capacitor start, inductor run.
 4. Capacitor start, capacitor run.
- E. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- F. Minimum Efficiency: 75 percent.
- G. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

2.3 THREE-PHASE MOTORS

- A. Description: NEMA MG-1, T-frame, Design B, induction-type motor, minimum class F insulation for 105°F ambient.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
1. Baldor.
 2. General Electric.
 3. Marathon.
 4. WEG.
 5. TECO.
 6. NIDEC.
- C. Materials:
1. Windings: Copper.
 2. Frame: Steel or cast iron.
 3. Rotor: Random-wound, squirrel cage.
 4. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading, L-10 life of 200,000 hours.
- D. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated.
- E. Service Factor:
1. 1 HP and Smaller: 1.25
 2. Above 1 HP: 1.15

- F. Full-load Electrical Efficiency: Based on motor size as indicated below, and shall comply with ASHRAE 90.1-2013, whichever is greater:
1. 1 HP and Smaller: 81.5%
 2. Above 1 HP to 5 HP: 86.5%
 3. Above 5 HP: 91%

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install motors and accessories according to manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work covered under this Section shall include the furnishing of the labor, equipment and materials necessary for the complete removal of existing underground fuel oil storage tank as shown on Drawings.

PART 2 - PRODUCTS

2.1 NOT APPLICABLE THIS SECTION

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILLING

- A. This Contractor shall do all excavating work necessary for the complete removal, as shown on the Drawings, of the underground fuel oil storage tank. The area where the tank has been removed and after the soil has been tested and approved, shall be backfilled with excavated materials free from large clods or stones, deposited in layers not to exceed 9" in thickness and compacted to the density Specified under Compaction.
- B. All materials excavated shall be deposited in a designated area approved by the Owner. Excavated material shall not be piled where it will interfere with traffic or other trade's work.
- C. Maintain excavation in good order and provide bracing where necessary to prevent caving, settlement, or damage. Provide necessary pumps, power, suction and discharge lines to keep all excavation free from standing water.
- D. All excavations are to be completed in a workmanlike manner, level and smooth.
- E. Backfill under parking lot and sidewalk shall be of Common Excavation Type A (material from above and around tank), Contractor Provided Borrow, and Aggregate Base Course Class 5 materials. Water shall be used as necessary to insure proper compaction of fill.
- F. All areas to be backfilled shall be thoroughly cleaned of all construction and other debris.
- G. After removal of the tank, this Contractor shall fill the opening with approved materials, place 8 inches of Aggregate Base Course Class 5 on top of the fill and leave the top of the Aggregate Base 3.5 inches below the existing asphalt parking lot.

3.2 COMPACTION

- A. Compaction shall be done in lifts as the backfill is deposited in layers as specified above.
- B. Compaction shall be to % of Standard Proctor density as listed below:
 - 1. Under pavement and sidewalks: 90% of Standard Proctor.
- C. Moisture content shall be within 2% to 3% optimum moisture as determined by ASTM D-698. Compaction density shall be as determined by ASTM D-698.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Balancing air systems.
 - 2. Balancing hydronic piping systems.
- B. The work covered by this Specification consists in furnishing all labor, engineering and test equipment required to adjust and balance the following:
 - 1. New hydronic systems.
 - 2. Existing hydronic systems.
 - 3. New air distribution systems.
 - 4. Measuring electrical performance of new HVAC equipment.
- C. The TAB Contractor shall be subcontractor of Division 23 Contractor.

1.2 DEFINITIONS

- A. Acronyms used in the specification are as follows:
 - 1. AABC: Associated Air Balance Council.
 - 2. NEBB: National Environmental Balancing Bureau.
 - 3. TAB: Testing, adjusting, and balancing.
 - 4. TABB: Testing, Adjusting, and Balancing Bureau.
 - 5. TAB Specialist: An entity engaged to perform TAB Work.

1.3 SUBMITTALS

- A. Submit Certified TAB reports to the Engineer.
 - 1. Format: PDF preferred; provide three copies if paper.
 - 2. Certification: By AABC or NEBB.

1.4 PROJECT CONDITIONS

- A. Partial Owner Occupancy: Owner may occupy completed areas of building before completion of test and balance. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.5 QUALITY ASSURANCE

- A. Division 23 Contractor shall employ an independent TAB Contractor specializing in total system air and hydronic testing and balancing.
 - 1. All personnel involved in the execution of the work under the TAB Contract shall be experienced and factory-trained specifically in the total balancing of mechanical systems, as well as being regular employees of the TAB Contractor.
 - a. TAB Technician: Employee of the TAB contractor and certified by AABC, NEBB, or TABB.

- B. The following contractors have been pre-approved to bid the TAB work:
 - 1. Air Dynamics; Granville, ND.
 - 2. Balancing Professionals; Fargo, ND.
 - 3. CL Linfoot; Grand Forks, ND.
 - 4. Design Control, Inc.; Fargo, ND.
 - 5. McFarlane, Inc.; Grand Forks, ND.
 - 6. Mechanical Data; Wayzata, MN.
 - 7. Mechanical Technology, Inc.; Billings, MT.
- C. Calibrate all instruments and provide verification of calibration provided with submittal data.

PART 2 - PRODUCTS (N/A)

PART 3 - EXECUTION

3.1 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts. Rubber or metal snap-in plugs are also acceptable.
 - 2. Install and join new insulation that matches removed materials.
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Verify interlocked systems are operating in conjunction.
- E. Take and report testing and balancing measurements in inch-pound (IP) units.
- F. Report deficiencies discovered before and during performance of testing, adjusting and balancing procedures.

3.2 REQUIREMENTS FOR AIR SYSTEMS

- A. System Diagrams: Include schematic layouts of air distribution systems. Present each system with minimum single-line diagram.
- B. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer. Record RPM and full load amperes.
 - 1. Measure total airflow in main supply ducts. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

3.3 REQUIREMENTS FOR HYDRONIC SYSTEMS

- A. Prepare hydronic systems for testing and balancing according to the following:
 - 1. Open all manual valves for maximum flow.
 - 2. Open all flow-control valves.
 - 3. Set system controls so all automatic valves are wide open.
 - 4. Check air vents for a forceful liquid flow exiting from vents when manually operated.
- B. Measure and record water flow and pressure at pumps.
 - 1. Verify pump-motor brake horsepower. Report when actual amperage exceeds nameplate amperage.
 - 2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve.
 - 3. Check pump-motor load. If motor is overloaded, throttle main flow-balancing devices so motor nameplate rating is not exceeded.
 - 4. Record suction pressure and discharge pressure.
- C. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.
- D. Measure flow at all pressure-independent characterized control valves, with valves in fully open position, to verify that valves are functioning as designed.
- E. Check hydronic coils for clean and straight fins and correct piping connections.
- F. Check air vents at coils and high points of the water system and verify all are installed and operating freely.
- G. Verify strainers have been flushed until free of all sediment.
- H. Verify that startup screens are replaced by permanent screens with indicated perforations.
- I. Measure and record flow at all balancing devices to design flow tolerance.

3.4 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

- A. Perform an inspection of existing equipment that is to remain and be reused.
 - 1. Measure and record the operating speed, airflow, and static pressure of each fan.
 - 2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
 - 3. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
 - 1. Compare the indicated airflow of the renovated work to the measured fan airflows.
 - 2. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
 - 3. Balance each air outlet.

3.5 TOLERANCES

- A. Set HVAC system airflow and water flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans: +5% to -5%
 2. Air Outlets and Inlets: +10% to -10%
 3. Heating/Cooling Water Flow Rate: +10% to -10%

3.6 FINAL REPORT GENERAL

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
 2. Name and address of the TAB contractor.
 3. Project name.
 4. Project location.
 5. Engineer's name and address.
 6. Contractor's name and address.
 7. Report date.
 8. Signature of TAB supervisor who certifies the report.
 9. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 10. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Deviation of final performance from design as percentage.
 - c. Notable characteristics of systems.
 - d. Description of system operation sequence if it varies from the Contract Documents.
 11. Notes to explain why certain final data in the body of reports vary from indicated values.

3.7 FINAL REPORT RECORDED DATA

- A. Motors:
1. Manufacturer.
 2. Model or Serial Number.
 3. Rated and measured Amperage and Voltage.
 4. Rated Horsepower.
 5. Rated and measured RPM.
 6. Sheave Size, Type and Manufacturer.
- B. Fans:
1. Manufacturer.
 2. Model or Serial Number.

3. Design and measured CFM.
 4. Design and measured RPM.
 5. Design and measured Pressures.
 6. Pulley Sheave Size, Type and Manufacturer.
 7. Belt Size and Quantity.
- C. Pumps:
1. Manufacturer.
 2. Model or Serial Number.
 3. Design and measured GPM.
 4. Design and operating Head.
 5. Suction and discharge pressure.
- D. Expansion Tanks:
1. Static water pressure.
- E. Air Systems (Including Inlets and Outlets):
1. Grille or Diffuser Reference Number and Location.
 2. Design and measured CFM.
- F. Heat Transfer Elements (Reheat Coils, Radiation, Unit Heaters, Cabinet Unit Heaters, Etc.):
1. Manufacturer and Type.
 2. Design and measured Pressure Drop.
 3. Design and measured Flow Rate.
- G. Water to Water Heat Exchangers:
1. Manufacturer and Type.
 2. Hot Side Design and measured Water Flow.
 3. Hot Side Design and measured Entering and Leaving Water Temperature.
 4. Cold Side Design and measured Water Flow.
 5. Cold Side Design and measured Entering and Leaving Water Temperature.
- H. Heating/Cooling Fluid:
1. Glycol Manufacturer
 2. Glycol Type
 3. Design and actual Concentration % by Weight or Temperature Protected to (°F.)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Duct Insulation.
 - 2. Equipment Insulation.
 - 3. Piping Insulation.
- B. The work covered by this Specification consists in furnishing all labor, equipment, accessories and materials and in performing all operations necessary for the installation of all insulation for the HVAC systems, in strict accordance with Section 230700 of this Specification and applicable Drawings and subject to the terms and conditions of the Contract.

1.2 SUBMITTALS

- A. Shop Drawings: For materials covered under this section as per Section 230500.
 - 1. Product Data: Each type of insulation.
- B. Operation and Maintenance Data: Per section 230500.
 - 1. Product Data: Each type of thermal and fire-rated insulation systems.

1.3 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- B. All insulation shall be installed in a workmanlike manner by skilled workmen regularly engaged in this type of work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Except in other Part 2 articles where noted, the following manufacturers are acceptable:
 - 1. Owens-Corning Fiberglass.
 - 2. Johns Manville.
 - 3. Knauf Insulation.
- B. All manufacturers are subject to compliance with requirements.
- C. Provide products by one of the manufacturers specified or by prior approval.

2.2 COMMON INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

2.3 INSULATION

- A. Fiberglass Wrap: Glass fibers bonded with a thermosetting resin; FSK or ASJ Max jacket. Comply with ASTM C 553, Type II and ASTM C 1290, Type I and Type III.
- B. Fiberglass Board: Glass fibers bonded with a thermosetting resin, semi-rigid; FSK or ASJ Max jacket. Comply with ASTM C 612, Type IA or Type IB.
- C. Fiberglass, Preformed Pipe Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ.
- D. High-Temperature, Fiberglass Board Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type III, without factory-applied jacket.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 - a. Fibrex Insulations Inc.; FBX.
 - b. Industrial Insulation Group (IIG); MinWool-1200 Industrial Board.

2.4 INSULATION JACKETS

- A. ASJ Max Jacket: Poly-encapsulated paper jacket; Factory applied shall comply with ASTM C1136, Type I, II, III, IV.
- B. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; Factory applied shall comply with ASTM C1136, Type II.
- C. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14; stucco embossed, 0.016" thick.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 - a. Childers Brand, Specialty Construction Brands, Inc.
 - b. Metal Jacketing Systems.
- D. PVC Jacket: Comply with ASTM D1784, Class 16354-C. High impact resistant, UV resistant, minimum 0.030" thick.

2.5 INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.6 SEALANTS

- A. Joint Sealants: Permanently flexible, elastomeric sealant, compatible with insulation materials, jackets, and substrates.

2.7 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

2.8 TAPES

- A. Tapes: Match jacket with compatible adhesive as recommended by jacket manufacturer.
- B. ASJ Max Tape: Foil-face, vapor-retarder tape; complying with ASTM C 1136, 3 inches wide.
- C. FSK Tape: Foil-face, vapor-retarder tape; complying with ASTM C 1136, 3 inches wide.
- D. Aluminum-Foil Tape: Vapor-retarder tape, 2 inches wide.
- E. PVC Tape: White vapor-retarder PVC tape, 2 inches wide.

2.9 SECUREMENTS

- A. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - 1. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - 2. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
 - 3. Adhesive-backed base with a peel-off protective cover.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.
- C. Wire: 12 gauge nickel-copper alloy or 14 gauge soft-annealed, stainless steel or 14 gauge soft-annealed, galvanized steel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install multiple layers of insulation with longitudinal and end seams staggered.
- C. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- D. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic. Install insulation continuously through hangers and around anchor attachments.

- E. Install insulation with jackets as follows:
 - 1. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip.
 - 2. Overlap jacket longitudinal seams at least 1-1/2 inches. Staple laps with outward clinching staples along edge.
 - 3. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 4. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- F. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate fittings and specialties using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic and reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 - 4. Stencil or label the outside insulation jacket of each union with the word "union."
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.4 FIBERGLASS INSTALLATION

- A. General Procedures:
 - 1. Apply adhesives according to manufacturer's recommended coverage rates of duct and plenum surfaces.
- B. Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 - 1. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 2. Install pins on sides and bottom of horizontal ducts and sides of vertical ducts wider than 12 inches. Cover exposed pins and washers with tape matching insulation facing.
 - 3. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier.

- C. Insulation Installation for Tanks and Vessels: Secure with adhesive and anchor pins.
 - 1. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
 - 2. Do not weld anchor pins to ASME-labeled pressure vessels.
 - 3. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 - 4. Secure each layer of insulation with stainless-steel or aluminum bands.
 - 5. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
 - 6. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
 - 7. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

3.5 FIBERGLASS PREFORMED PIPE INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:
 - 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 - 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 - 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
 - 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 - 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- C. Insulation Installation on Valves and Pipe Specialties:
 - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 - 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3.6 BOILER BREECHING INSULATION SCHEDULE

- A. Round, Breeching and Connector: High-temperature mineral-fiber board, 3 inches thick and 3-lb/cu. ft. nominal density.

3.7 INDOOR DUCT AND PLENUM SCHEDULE

- A. Fiberglass board, with FSK facing:
 - 1. Outdoor-Air Duct and Plenums.
 - 2. Ducts and Plenums in Mechanical Rooms.
 - a. Provide mastic on ducts in Mechanical Rooms.
- B. Insulation not required:
 - 1. Supply-Air Ducts and Plenums in exposed, conditioned spaces.
 - 2. Factory-insulated flexible ducts.
 - 3. Factory-insulated plenums and casings.
 - 4. Flexible connectors.
 - 5. Vibration-control devices.
 - 6. Factory-insulated access panels and doors.
- C. Minimum Duct Insulation R-Values
 - 1. Outside air ducts: R-12.

3.8 EQUIPMENT INSULATION SCHEDULE

- A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.
- B. Heat-Exchanger (Water-to-Water for Heating Service) Insulation: Fiberglass pipe and tank, 2 inches thick.
- C. Heating-Hot-Water Pump Insulation: Mineral-Fiber Board: 2 inches thick and 3-lb/cu. ft. nominal density.
- D. Heating-Hot-Water Expansion/Compression Tank Insulation: Fiberglass Pipe and Tank: 1 inch thick.
- E. Heating-Hot-Water Air-Separator Insulation: Fiberglass Board: 2 inches thick.

3.9 PIPING INSULATION SCHEDULE

- A. Indoor, Aboveground:
 - 1. Heating-Hot-Water Supply and Return, 200°F and Below: Fiberglass.
 - a. 1-1/4 inch diameter pipe and smaller: 1-1/2 inches thick, R-6 minimum.
 - b. 1-1/2 inch pipe diameter and larger, 2 inches thick, R-8 minimum.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. The Automatic Temperature Control (ATC) Company bidding this Section of Work shall be a Subcontractor to the Division 23 HVAC Contractor.
- B. Furnish all labor, materials, equipment, and service necessary for a complete and operating Building Automation System (BAS), utilizing Direct Digital Controls (DDC) for energy management, equipment monitoring and control, and subsystems as defined in Project Documents. In general, all material and equipment used shall be standard components, regularly manufactured and available and not custom designed especially for this project.
- C. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers.
- D. System points lists included in the Documents are intended to show the desired alarm, monitoring, and control points. Add any control points necessary and as required to accomplish the sequence of operations.
- E. See Section 230980 "Sequence of Operations for HVAC Controls" for requirements that relate to this Section.
- F. Additional items of work:
 - 1. The building automation system shall seamlessly integrate with the existing Schneider temperature control system and shall be fully integrated with the existing building front end system.
 - 2. Remove all controls related pneumatic tubing and electrical conduit that is not reused as part of the new direct digital control and monitoring system.

1.2 DEFINITIONS

- A. Acronyms used in this specification are as follows:
 - 1. BAS: Building Automation System.
 - 2. NAC: Network Area Controller.
 - 3. ASC: Application Specific Controllers.
 - 4. GUI: Graphical User Interface.
 - 5. DDC: Direct Digital Controls.
 - 6. OEM: Original Equipment Manufacturer.
 - 7. VFD: Variable Frequency Drive.

1.3 DIVISION OF WORK

- A. Following divisions of work are generally applicable unless otherwise noted.
- B. ATC contractor provides:
 - 1. All controllers, control devices, control panels, controller programming, controller programming software.
 - 2. Control components for terminal heating and cooling units not supplied with factory-wired controls.

3. Software and programming of BAS, GUI, development of all graphical screens, setup of schedules, logs and alarms, network management, global supervisory control applications, system integration and coordination and connection of the NAC to the local or wide area network.
 4. BAS and Temperature Control wiring for a complete and operable system. All wiring shall be done in accordance with Division 26 of the specification and all local and national codes.
 5. Provide third party interfacing for sub-systems such as:
 - a. Boilers:
 6. Fire Alarm/Life Safety System. The DDC system shall monitor general alarm status of the fire alarm/life safety system via an alarmable point in the form of a dry contact. An addressable relay of the fire alarm system will be provided and terminated by Division 26, located next to the appropriate DDC panel. This Section will provide wiring from the relay to the DDC panel.
- C. Products provided by ATC contractor for installation by the Mechanical contractor:
1. Control valves.
 2. Control dampers.
 3. Wells for hydronic temperature sensors.
 4. Static and differential pressure sensors for piping systems.
- D. Products provided by Mechanical contractor:
1. Balancing dampers.
- E. Electrical contractor provides, in accordance with Division 26 and Division 28:
1. Providing motor starters and disconnect switches.
 2. Power wiring and conduit.
 3. Provision, installation and wiring of smoke detectors.

1.4 SUBMITTALS

- A. Shop Drawings shall be submitted on the equipment covered under this section as per Section 230500.
1. Schematic flow diagrams.
 2. Power, signal, and control wiring diagrams.
 3. Details of control panel faces.
 4. Input devices.
 5. Damper schedule.
 6. Valve schedule.
 7. DDC System Hardware: Wiring diagrams, schematic floor plans, and schematic control diagrams.
 8. Control System Software: Schematic diagrams, written descriptions, and points list.
- B. Operation and Maintenance Manuals: For system covered under this section as per Section 230500.

1.5 JOB CONDITIONS

- A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. All products of the BAS shall be provided with the Agency and Code Approvals: following agency approvals. Verification that the approvals exist for all submitted products shall be provided with the submittal package. Systems or products not currently offering the following approvals are not acceptable.
 - 1. UL-916; Energy Management Systems
 - 2. ULC; UL - Canadian Standards Association
 - 3. FCC, Part 15, Subpart J, Class A Computing Devices

1.7 WARRANTY

- A. All systems and components shall be guaranteed against defects in material, workmanship and installation for a period of one year after completion. The guarantee period shall start after final owner instruction and system certification of system operation.

PART 2 - PRODUCTS

2.1 BUILDING AUTOMATION SYSTEM (BAS)

- A. Manufacturers: Subject to compliance with requirements, the BAS shall be an extension of existing system manufactured by the following:
 - 1. Johnson Controls, Inc.; Johnson Controls Group.
 - 2. Procontrols Midwest; Honeywell Home and Building Control.
 - 3. Energy Tech Systems; Schneider Electric I/A.
 - 4. UHL Company; Building Automation.
- B. Upgrade the existing BAS system to the latest software version that the existing equipment is capable of handling.
- C. BAS shall be comprised of a network of interoperable, stand-alone digital controllers, a computer system, graphical user interface software, network devices and other devices as specified herein.
 - 1. Network Area Controller: Manage the Energy and Building Management capabilities of the automation system as well as facilitate remote communications and central monitoring.
 - 2. Application Controllers: Provide distributed, engineered control to the mechanical equipment specified, capable of stand-alone operation.

3. The Data Communications: Allow data to be shared between the various controllers in the architecture.
4. System Software: Include system software and site licenses for global application functions, application software for distributed controllers, and operator interface software.
5. End devices such as sensors, actuators, dampers, valves, and relays.
6. The failure of any single component shall not interrupt the control strategies of other operational devices. System expansion shall be through the addition of end devices, controllers, and other devices described in this specification.

D. System Accuracy and Display:

1. Space Temperature Accuracy: +/- 0.5°F.
2. Duct Temperature Accuracy: +/- 1°F.
3. Water Temperature Accuracy: +/- 1°F.
4. Pressure Accuracy: +/- 5% of range.
5. Airflow: +/- 4% of range; display to nearest 1 cfm.
6. Humidity Accuracy: +/- 3% RH.

2.2 USER ACCESS AND INTERFACE

A. User Access: Connect through the facility LAN and remotely.

1. Permit a minimum of 4 simultaneous users to access the system over the LAN.
2. Access level based on passwords.
 - a. Appropriate levels of security (access) shall be maintained to insure the operability of the system.
 - b. Provide access for Engineer, owner, and temperature control contractor.
3. Capability to monitor parameters, change set points, view and set up trends, start/stop controlled equipment, modify calendars, view and acknowledge alarms.
 - a. Remote user shall have this capability without having the system data base loaded on remote computer.

B. Remote Access: Include the capability for multiple users to access the BAS simultaneously from remote locations via standard Internet browsers without requiring proprietary operator interface and configuration programs.

C. User Graphical Interface: Dynamic animated color graphic displays.

1. Floor Plan: Color graphics. Display zone numbers and zone temperatures; color-code based on zone temperature and zone setpoint. Provide link from zones to screen depicting the equipment serving the zone.
2. Mechanical Equipment: Display color graphics, animations to indicate on/off status, current values of monitored and control points. Setpoints shall be overridden or modified from this screen.
3. System Selection/Penetration: Access the various system schematics and floor plans via a graphical penetration scheme or menu selection.
4. Dynamic Animated Data Displays: Dynamic temperature values, humidity values, flow values, and status indication shall be shown in their actual respective locations and shall automatically update to represent current conditions without operator intervention.
5. Alarm Annunciation: Any point in a state of alarm shall change the color of its symbol to red until it is no longer in alarm.

6. Help System: Provide a context sensitive, on-line help system available for all applications with relevant data for that particular screen.
7. Existing Graphics: On projects where existing temperature control systems and graphics are being revised or added to the existing temperature control system, the following shall be provided:
 - a. Update existing graphics with updated floor plan including changes and additions associated with this project.
 - b. Graphics for existing equipment and floor plans shall be consistent with the format of the graphics for new equipment and floor plans.
 - c. Display all relocated and new control devices, controls setpoints, and monitoring points on the new graphics floor plan.

2.3 ALARM MANAGEMENT

- A. Alerts: Include a paging feature with telephone/email alerts to selected personnel for critical alarms as defined by Owner.
- B. Alarm Management: Monitor, buffer, and direct alarm reports to operator devices.
- C. Alarm Message: Include control point's English language description, time and date of occurrence, and purpose of alarm.
- D. Prioritization:
 1. Fault Alarm: Highest priority alarm. Unit shutdown until condition is gone and fault is manually cleared.
 2. Problem Alarm: Unit operation is modified to compensate and alarm automatically clears when the condition is gone.
 3. Warning Alarm: Lowest priority alarms. Alarm is indicated to alert operator of condition that needs attention.
- E. Annunciation: Provide page to display all alarms from all equipment for operator to check on regular basis.
 1. Fault Alarms: Screen message text, email, pagers, graphic with flashing alarm objects, SMS texting, and/or other method selected by owner.
 2. Problem Alarms: Screen message text, flashing graphic, and/or other method selected by owner.
 3. Warning Alarms: Flashing graphic on equipment page.
 4. Alarm Log: Record each alarm, available for review by the user, and containing the following information (at a minimum):
 - a. Time and date.
 - b. Location (building, floor, zone, office number, etc.).
 - c. Equipment (boiler #, accessway, etc.).

2.4 SYSTEM PERFORMANCE ANALYSIS

- A. Provide: For each major mechanical system (such as air handlers, chillers, boilers, etc.). For each of these systems, display:
 1. Dynamic animated flow diagrams.

2. Graphical representation of all analog values associated with the mechanical system, plotted on an X-Y axis graph over the previous twenty-four-hour period with automatic scaling.
 3. Space temperature summaries from each zone being served by mechanical system.
- B. Data Logging: Collect data for any property of any object and store this data for future use. All log data shall be available to the user in the following data formats:
1. HTML.
 2. Plain Text.
 3. Comma or tab separated values.

2.5 NETWORK AREA CONTROLLER

- A. Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; integral interface equipment; and backup power source.
- B. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation.
- C. Stand-alone mode control functions operate regardless of network status.
- D. This Contractor shall supply one or more NAC as part of this contract. Number of area controllers required is dependent on the type and quantity of devices.

2.6 APPLICATION CONTROLLERS

- A. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.
 1. Scheduling, alarming, trending, and network management received from NAC.
- B. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.
 1. Stand-alone mode control functions operate regardless of network status.
 2. Battery backup for a minimum of 72 hours is also permissible.
- C. Hardware: Suitable for anticipated ambient conditions.

2.7 CONTROL PANELS

- A. Description: Wall-mounted, provide as required to contain all relays, terminal strips, power supplies and other equipment in the BAS.
- B. Materials: UL listed, NEMA 1 minimum, 14 gauge steel minimum with stiffeners, continuous hinge doors. Panels may be constructed of structural plastic meeting UL and NEMA requirements.
- C. Weatherproof: For control devices located in areas subject to outside weather conditions.

2.8 ELECTRICAL DEVICES

- A. Surge Protector: Provide; Diagnostic LED that indicates ground presence, system power and SPD function.

- B. Relays: Indicator light.
- C. Emergency shut-off switches
 - 1. Description: Mushroom style boiler emergency shut-off.
 - 2. Operator: Large, heavy duty, mushroom type; pull to reset.
 - 3. Label: Indicate emergency boiler shutdown.

2.9 INPUT SENSORS

- A. General Requirements: Installation, testing, and calibration of all sensors, transmitters, and other input devices shall be provided to meet the system requirements; vibration and corrosion resistant.
 - 1. Wireless not acceptable.
 - 2. No digital readout display unless otherwise noted.
- B. Occupancy Sensor: Dual technology, with time delay, daylight sensor lockout, sensitivity control, and 180-degree field of view with vertical sensing adjustment; for flush mounting.
- C. Temperature Sensors: Furnish in scale ranges compatible with system operating range.
 - 1. Accuracy: Plus or minus 0.5°F at calibration point.
 - 2. Room Sensors:
 - a. Mounting: Surface or wallbox.
 - 3. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight; minimum range -45°F to 120°F.
 - 4. Duct Sensor:
 - a. Insertion Elements: Single point, 8 inches long.
 - 5. Liquid Sensor: Immersion elements with brass or stainless-steel socket, threaded for easy servicing.
- D. Low Temperature Limit Switches: Manual reset, triggering on low temperature as sensed by any 18" maximum section.
 - 1. Length: 1 foot long for each square foot of coil area.
- E. Pressure Transmitters/Transducers:
 - 1. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.
 - a. Accuracy: 2% of full scale with repeatability of 0.5%.
 - b. Building Static-Pressure Range: 0 to 0.25 inch wg.
 - c. Duct Static-Pressure Range: 0 to 5 inches wg.
 - 2. Water Pressure Transducers: Stainless-steel diaphragm construction; minimum 150-psig operating pressure.
 - 3. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction; minimum 150-psig operating pressure and tested to 300-psig.
- F. Air and Water Flow Proof Devices: Solid state, adjustable, current operated relays with LED indicator.
 - 1. Pressure differential switches are acceptable.

- G. Air Filter Switches: Differential pressure switches, automatic reset.
 - 1. Provide appropriate scale range and differential adjustment for intended service.
- H. Air Pressure Safety Switches: Manual reset with appropriate scale range and differential adjustment for intended service.
- I. Damper Position Indication: Electric switch type on two-position dampers to indicate fully open and fully closed. Provide where proof of position is required in sequence of operations.
- J. Basic Water Flow Meters: Provide insertion electromagnetic flow meter and BTU meter that provides output signal to DDC.
 - 1. Accuracy: +/- 1% of reading from 0.25-20 ft/sec.
 - 2. Temperature Range: 15-250°F.
- K. Carbon Monoxide Detectors: Single or multichannel, dual-level detectors using solid-state plug-in sensors with a 3-year minimum life; suitable over a temperature range of 32 to 104 °F; with 2 factory-calibrated alarm levels.

2.10 OUTPUT DEVICES

- A. Damper and Valve Actuators:
 - 1. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
 - a. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
 - b. Fail-Safe Operation: Mechanical, spring-return mechanism at locations with freeze potential. Fail last position otherwise. Provide external, manual gear release on nonspring-return actuators.
- B. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.
 - 1. Terminal Unit Control Valves: Characterized ball, forged brass body, stainless steel trim, two- or three-port as indicated, replaceable plugs and seats, union and threaded ends.
 - a. Rating: Class 125 for service at 125 psig and 250°F operating conditions.
 - b. Sizing: 3-psig maximum pressure drop at design flow rate, to close against pump shutoff head, not less than one-half the line size.
 - 2. Butterfly Valves: 200-psig, 150-psig maximum pressure differential, ASTM A 126 cast-iron or ASTM A 536 ductile-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals.
 - a. Disc Type: Nickel-plated ductile iron or Aluminum bronze.
 - b. Sizing: 5-psig maximum pressure drop at design flow rate.
- C. Control Dampers: AMCA-rated; tight closing, low leakage.
 - 1. Bearings: Stainless steel or oil-impregnated bronze.
 - 2. Damper Blades: Minimum 16 ga. galvanized steel or aluminum; maximum 6" width; maximum 48" length.
 - 3. Blade Construction: One piece rolled with exposed or concealed linkage for face velocities of 1500 FPM or below; Airfoil type with double skin construction and linkage out of airstream for face velocities above 1500 FPM.

4. Damper Frames: Minimum 16 ga. galvanized steel or aluminum; provide stiffening or bracing for any section exceeding 48" in height.
 5. Edge Seals: Closed-cell elastomeric on blades, flexible stainless steel on sides.
 6. Opposed Blade Dampers: Use for throttling airflow.
 7. Parallel Blade Dampers: Use for two position, open/close control.
 8. Smoke Control Dampers: UL 555 listed.
- D. Control Relays: modular plug-in design with retaining springs or clips.
1. Integral indicator light and check button.

PART 3 - EXECUTION

3.1 CONTROL PANEL INSTALLATION

- A. Locations shown on the drawings are recommended locations and do not indicate actual quantity or location. Generally, locate all panels in mechanical and electrical rooms. Control panels will not be installed in public areas unless otherwise noted. Control panels will not be recessed installed on an exterior wall where condensation can accumulate in panel.
- B. All control devices located in exposed areas subject to outside weather conditions shall be mounted inside weatherproof enclosures. Location of each panel shall be convenient for adjustment service.
- C. Engraved nameplates shall be provided beneath each panel face mounted control device describing the function of each device.
- D. All electrical devices within the panel shall pre-wired to terminal strips with all inter-device wiring within the panel completed prior to installation of the system.

3.2 EMERGENCY SWITCH INSTALLATION

- A. Install boiler emergency switches near boiler room exit doors and where shown on the Drawings. Attach label.

3.3 INPUT SENSOR INSTALLATION

- A. Mount duct mount sensors in an electrical box through a hole in the duct and position to be easily accessible for repair or replacement.
- B. Install outside air sensors out of direct sunlight.
- C. Differential pressure sensors used to control equipment such as fans and pumps shall be connected directly to the same controller that controls the equipment to ensure the continued proper operation of the controlled equipment without dependence on the control network.
- D. Calibrate current switches to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.
- E. Mount low temperature limit switches horizontally across duct in accordance with manufacturers recommended installation procedures. For large duct areas where the sensing element does not provide full coverage of the air stream, additional switches shall be provided as required to provide full protection of the air stream.

3.4 OUTPUT DEVICES INSTALLATION

- A. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.
- B. All instrument wells, valves, and dampers are furnished by Controls Contractor and installed by the Division 23 contractor.

3.5 IDENTIFICATION

- A. Major Equipment: Provide label with associated DDC point name. Major equipment includes all mechanical equipment scheduled on the Drawings.
- B. DDC Control Panels: Provide label with ATC name, "Prairie Engineering, P.C.".
- C. Misc. Switches or Other Special Function Devices: Provide phenolic labels with indication of device function or as directed on the Drawings.
- D. Room Sensors: No label.

3.6 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. Install raceways, boxes, and cabinets according to Division 26.
- B. Install building wire and cable according to Division 26.
- C. Install signal and communication cable according to Division 27.
- D. All junction boxes, junction box covers and raceway systems except those embedded directly in earth or concrete, or surface metal raceway systems (wiremold), shall be externally identified by permanent bright blue paint suitable for the purpose, to easily distinguish from other communication or power raceway systems. Items shall be painted prior to installation. In addition to field painted conduit, factory painted conduit as manufactured by Allied Tube & Conduit (Data Com Blue Steel EMT), acceptable.
- E. Provide conduit in mechanical rooms, and in rooms without ceilings.
- F. Bundle and harness exposed multiconductor instrument cable in place of single cables where several cables follow a common path.
- G. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
- H. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
- I. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.
- J. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.
- K. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.
- L. The Temperature Control Contractor shall provide any line voltage wiring required for local or central control panels. Power may be extended from the nearest receptacle circuit or spare circuit breaker in nearest normal power panel.

- M. The Division 26 Contractor shall furnish all power wiring to electrical starters and motors.

3.7 TREND LOGS

- A. Prepare trend logs for all points required to show system calibration and stability.
- B. These logs shall document building operation after the installation, balancing and calibration is completed and after the control system is fully operational.

3.8 CLEANING

- A. Remove all protective labels and coverings from room sensors.

3.9 FIELD QUALITY CONTROL

- A. Perform all necessary calibration, testing and de-bugging, and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.
- B. Demonstrate complete and proper operation of all systems per the Sequence of Operations to Engineer. The demonstration shall include, but not necessarily be limited to, the following:
 - 1. Review of the trend logs.
 - 2. Complete and proper operation of control systems including setpoints, valve positions, etc. shall be adjusted to artificially induce the sequences to occur.
 - 3. Access to all devices for required maintenance.
 - 4. Review of associated graphics on Host.
 - 5. Identify and configure alarms.
- C. Upon project completion provide oral operating and maintenance instruction to the owner's representative for a minimum of 8 hours during normal working hours. The contractor shall assist the owner in videotaping the instruction if they choose to do so. Instructions shall include:
 - 1. A brief description of the controls' sequence of operation.
 - 2. A discussion and explanation of all alarms, switches and gauges.
 - 3. A summary and explanation of steps to be taken in response to specific alarms or control malfunctions.
 - 4. Building walk-through to physically locate and examine all control devices and demonstrate control setpoint adjustment procedures.
 - 5. Instructions regarding adjustment procedures shall emphasize methods for continual building "fine-tuning"
- D. Provide written operating and maintenance instruction including a copy of each of the above-mentioned submittals, inspection and calibration frequency and cleaning methods with recommended cleaning materials. Provide 2 copies to the Engineer in 3-ring binders.
- E. Satisfactory completion is when all required training and testing to show performance compliance with the requirements of the Contract Documents has been performed to the satisfaction of the Engineer. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.10 DUCT SENSOR SCHEDULE

A. Insertion Elements:

1. Use where not affected by temperature stratification.
2. Ducts are smaller than 9 sq. ft.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes control sequences for HVAC systems and equipment.
- B. It is the intent of this specification to describe the HVAC control system. The intent shall be met by providing a complete and properly operating system as described by the specifications and detailed on the drawings. Equipment shall be furnished as required and shall include all incidental items necessary to meet the intent, even though not completely detailed herein.
- C. See Section 230900 "HVAC Controls" for control equipment and devices and for submittal requirements.

1.2 ABBREVIATIONS

- A. The following abbreviations may be used in this specification.
 - 1. DAT: Discharge air temperature.
 - 2. OAT: Outdoor ambient temperature.
 - 3. HWS: Supply hot water.
 - 4. HWR: Return hot water.
 - 5. Occ/Unocc: Occupied/Unoccupied.
 - 6. Temp: Temperature.
 - 7. User adj: User adjustable.

PART 2 - PRODUCTS (N/A)

PART 3 - EXECUTION

3.1 OCCUPANCY SCHEDULES

- A. Description: Method for setting occupied/unoccupied mode.
 - 1. Coordinate with owner to set schedules as required.

3.2 ALARM NOTIFICATION

- A. Description: Establish recipients for e-mail alerts.
- B. Alarm Annunciation:
 - 1. Controls Interface: Flashing graphic on equipment page.
 - 2. E-mail Alerts: Coordinate with owner for designated recipients and enter e-mail addresses into controller.

3.3 HYDRONIC SYSTEM PRESSURE

- A. Description: Hydronic pressure monitoring.
 - 1. Provide pressure sensor.
- B. Emergency Pressure Sequence: Monitor hydronic system pressure.
 - 1. Condition: System pressure below 5 psi. Action: Trigger alarm.

C. User Interface Display:

1. System pressure.
2. Alarm.

3.4 BLOWER COIL HEATING SYSTEM

A. Description: Load circulation pump, and water-to-water flat plate heat exchanger.

1. Provide: Source side modulating control valve, normally closed.
2. Provide: Heat exchanger source and load HWS/HWR temperature sensors.
3. Provide: Pressure sensor at expansion tank.
4. Provide: User activated start/stop button, momentary contact; indicator light.

B. Circulator Pump Sequence: Monitor start/stop button and OA temperature sensor.

1. Condition: Pump off and start/stop button pressed. Action: Activate pump, delay deactivation for 30 minutes.
2. Condition: Pump on and start/stop button pressed. Action: Deactivate pump, override delay.
3. Condition: OAT above 60°F. Action: Deactivate pump.
4. Condition: OAT below 60°F. Action: Activate pump.

C. Indicator Light Sequence: Interlock with circulator pump so light is on when pump is active.

D. Control Valve Sequence: Monitor circulator pump, load side HWS and HWR, source side HWR.

1. Load HWS Maximum Setpoint: 170°F.
2. Condition: Pump activated. Action: Modulate valve to increase load side HWS temperature gradually up to 170°F.
3. Condition: Pump inactive. Action: Close valve.
4. Condition: Source HWR below 102°F. Action: Deactivate pump. Trigger Fault alarm.

E. Problem Alarms:

1. System pressure below 5 PSI.

F. User Interface Display:

1. Graphic for system start/stop.
2. OAT.
3. Control valve position as percent open.
4. Pump status.
5. Heat exchanger load side HWS and HWR temperatures.
6. Heat exchanger source side HWS and HWR temperatures.
7. System pressure.
8. Alarms.
9. BAS system graphic.

3.5 BLOWER-COIL UNIT

A. Description: Fan and hydronic heating coil.

1. Provide: DAT sensor.

2. Provide: OAT sensor.
 3. Provide: Filter status differential pressure sensor.
 4. Provide: Normally open, 2-way modulating control valve, heating.
- B. Fan Sequence: Occ/Unocc mode.
1. Condition: Occupied mode. Action: Activate fan.
 2. Condition: Unoccupied mode. Action: Deactivate fan.
- C. Heating Control Valve Sequence: Monitor zone temp, DAT, and Occ/Unocc mode.
1. Condition: OAT less than 60°F. Action: Modulate to maintain DAT setpoint.
 2. Condition: OAT greater than 60°F. Action: Close.
- D. Alarm:
1. Problem Alarm: DAT 5°F (user adj.) below setpoint.
 2. Problem Alarm: DAT 10°F beyond setpoint.
 3. Warning Alarm: Dirty filters.
- E. User Interface Display:
1. Occ/Unocc mode.
 2. Control-valve positions as percent open.
 3. Fan operation status.
 4. SAT: actual and setpoint.
 5. OAT.
 6. Heating status.
 7. Damper positions.
 8. Filter Normal/Dirty status.
 9. Alarms.
 10. BAS system graphic.

3.6 HOT WATER LOOP

- A. Description: Boiler; hydronic pumps: primary hot water circulators, lead/lag, on/off operation.
1. Provide: Proof of flow for each pump.
 2. Provide: Temperature sensors for outside air, HWS, HWR.
 3. Provide: Boiler and pump controller.
 4. Provide: Wiring to boiler controls for proof of flow and factory furnished sensors.
 5. Provide: Boiler emergency kill switch at each boiler room exit.
 6. Provide: Wiring from boiler circulator to boiler factory controls.
 7. Provide: Wiring as required for communication between multiple boiler controllers.
- B. Hydronic Pumps Lead/Lag Sequence: Monitor calendar, lead pump proof of operation.
1. Condition: Day one of month. Action: Alternate lead/lag pumps, activate lead pump.
 2. Condition: Lead pump fail. Action: Alternate lead/lag pumps, trigger alarm, activate lag pump.
- C. Electric Boiler Hydronic Standby Pump Sequence: Monitor calendar & time, pump proof of operation.
1. Condition: Day of week (Wednesday, user adj.). Action: Activate pump for one hour.

2. Condition: Pump fail. Action: Trigger alarm.
- D. Lead Pump Sequence: Monitor OAT, lead pump status.
1. Condition: Below 50°F. Action: Activate pump.
 2. Condition: Above 50°F. Action: Deactivate pump.
- E. Multiple Boiler Lead/Lag Status: By boiler factory controller.
- F. Boiler HWS Setpoint Sequence: Monitor OAT.
1. Hot Water Supply Temperature: Maintained by boiler factory controls.
 2. Condition: OAT between 0°F and 20°F. Action: Adjust setpoint linearly from 180°F to 140°F.
- G. Alarm:
1. Alarm: HWS temperature 15°F below setpoint.
- H. User Interface Display:
1. OAT.
 2. Lead/Lag status.
 3. Pump operation status.
 4. HWS temperature: actual and setpoint.
 5. HWR temperature.
 6. Boiler operation.
 7. Alarms.
 8. System graphics.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Removal of underground 10,000-gallon heating fuel oil storage tank.
- B. Related Work Specified Elsewhere:
 - General Provisions Section 230500
 - Excavation and backfill Section 230530
- C. Schedule: Tank removal and excavation site back fill shall be completed no later than June 1, 2020.

1.2 TANK DISPOSAL

- A. Removed steel underground storage tanks will be transported to an approved disposal facility. A Certificate of Tank Disposal will be issued after the tanks have been processed.

1.3 PRODUCT REMOVAL

- A. The Owner will arrange for removal of usable product from the tank.
- B. The Owner shall provide to the Contractor seven (7) days advance notice of the date when the tank may be emptied. This Contractor shall remove (and dispose of in an approved manner) unusable product residue prior to disposal of tank.

1.4 EXISTING HOLD-DOWN PADS

- A. Remove and dispose of concrete pads above and/or below tanks.
- B. Concrete and reinforcing shall be disposed of off-site.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 NORTH DAKOTA HEALTH DEPARTMENT REQUIREMENTS

- A. This Contractor shall notify the Department of Health, in writing, of the scheduled removal of the tanks thirty (30) days before the contractor begins closure as required by the guidelines. The Contractor shall provide to the Owner and the Engineer copies of the notification for their records.
- B. This Contractor shall be required to contact the Department of Health, by telephone, at least five (5) working days in advance of the scheduled closure. This Contractor shall verify that a representative of Owner and/or the Department of Health will be on site during the actual removal of the tanks.
- C. A representative of the North Dakota Health Department and/or the Engineer and Owner will be present to perform an on-site evaluation of each tank excavation to determine if there is any soil contamination from fuel spills or tank leaks. The on-site assessment for each excavation shall be documented for future reference. If there is evidence of soil contamination from tank spill/leakage the North Dakota Health Department shall be notified within 24 hours.

- D. Contractor shall provide Owner with a copy of the certificate of disposal for each removed tank. The tanks must be disposed in accordance with North Dakota Health Department requirements. The Owner will submit amended SFN10980 along with certificate of tank disposal and documentation that tanks have not leaked or that contaminated soil was disposed of properly to the Waste management Division of the North Dakota Health Department.
- E. The Contractor shall complete form SFN16932 (1/92), The Underground Storage Tank Removal Form, from the North Dakota State Department of Health and Consolidated Laboratory, and forward to the Department with a copy furnished to the Owner.

3.2 DISPOSAL OF SOILS

- A. A unit cost (\$/yd) change order will be negotiated for the removal from the project site and the proper disposal of any soils found during the excavation of the fuel tanks which are contaminated with petroleum products. Disposal site shall be subject to approval by the Department of Health.
- B. Temporary stockpiling of the contaminated soils on the project site shall be coordinated with the Owner. All stockpiled soils shall be covered with plastic sheeting, 10-mil thickness, weighed down to prevent removal by the wind. Soils may be stockpiled on site, a maximum of fifteen (15) days from excavation.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes:
 - 1. Pipe and fitting materials, and joining methods for the following:
 - a. Hot-water heating piping.
 - b. Condensate-drain piping.
 - c. Air-vent piping.
 - d. Safety-valve-inlet and -outlet piping.
 - e. Natural gas piping.

1.2 REFERENCE

- A. Refer to Section 230510 "Common Work Results For Piping" for requirements of hangers, sleeves, sleeve seals, and escutcheons.

1.3 SUBMITTALS

- A. Shop Drawings: For equipment covered under this section as per Section 230500.
- B. Operation and Maintenance Manuals: For equipment covered under this section as per Section 230500.

1.4 QUALITY ASSURANCE

- A. All piping shall be installed in a workmanlike manner by skilled workmen regularly engaged in this type of work.
- B. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
 - 1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- B. Grooved-End Copper Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 - a. Anvil International, Inc.
 - b. Victaulic Company.
 - 2. Grooved-End Copper Fittings: ASTM B 75, copper tube or ASTM B 584, bronze casting.

3. Grooved-End-Tube Couplings: Rigid pattern, unless otherwise indicated; gasketed fitting. Ductile-iron housing with keys matching pipe and fitting grooves, EPDM gasket rated for minimum 230 °F for use with housing, and steel bolts and nuts.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- D. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- E. Copper Pressure-Seal Fittings: ASME B16.51, press-connect pressure fittings.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 - a. Mueller Streamline Co.
 - b. NIBCO, Inc.
 - c. Viega, LLC.
 2. Fittings for 2" and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end with leakage path feature to provide identification of un-pressed connections.
 3. Fittings for 2-1/2" to 4": Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal and stainless-steel grip ring in each end.

2.2 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.
- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes as indicated in Part 3 "Piping Applications" Article.
- C. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, as indicated in Part 3 "Piping Applications" Article.
- D. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.
- E. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.
- F. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 1. Material Group: 1.1.
 2. End Connections: Butt welding.
 3. Facings: Raised face.
- G. Grooved Mechanical-Joint Fittings and Couplings:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 - a. Anvil International, Inc.
 - b. Victaulic Company.

2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
3. Couplings: Ductile- or malleable-iron housing and synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

H. Cold Press Mechanical-Joint Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 - a. Viega, LLC.
2. Fittings: Cold Press Mechanical Joint Fitting shall conform to material requirements of ASTM A420 or ASME B16.3 and performance criteria of ANSI/CSA LC4. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer.
 - a. Gas Fittings: Conform to material requirements of ASME B31.9 and performance criteria of ANSI/CSA LC4a/CSA 6.32a.

2.3 PLASTIC PIPE AND FITTINGS

- A. PVC Plastic Pipe: ASTM D 1785, Schedules 40 and 80, plain ends as indicated in Part 3 "Piping Applications" Article.
- B. PVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM D 2466 for Schedule 40 pipe; ASTM D 2467 for Schedule 80 pipe.

2.4 CORRUGATED, STAINLESS-STEEL TUBING

- A. Comply with ANSI/IAS LC 1.
- B. Manufacturers: Subject to compliance with requirements, provide piping by one of the following or other prior approved:
 1. OmegaFlex, Inc.
 2. Parker Hannifin Corporation; Parflex Division.
 3. Titeflex.
 4. Tru-Flex Metal Hose Corp.
- C. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
- D. Coating: PE with flame retardant.
 1. Surface-Burning Characteristics: As determined by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 50 or less.
- E. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends.

- F. Striker Plates: Steel, designed to protect tubing from penetrations.
- G. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections for pipe inlet and corrugated tubing outlets.
- H. Operating-Pressure Rating: 5 psig.

2.5 TRANSITION FITTINGS

- A. Plastic-to-Metal Transition Fittings shall be CPVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions, and one end with threaded brass or stainless steel insert and one solvent-cement-socket end.
- B. Plastic-to-Metal Transition Unions shall be CPVC four-part union with brass threaded end, solvent-cement-joint plastic end, rubber O-ring gasket, and union nut.

2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Nipple:
 - 1. Comply with ASTM F1545.
 - 2. Pressure Rating: 425 psi at 225°F.
 - 3. Materials: Carbon steel body with crosslinked polyethylene (PEX) plastic insert.
- C. Dielectric Unions:
 - 1. Standard: ASSE 1079.
 - 2. Pressure Rating: 125 psig minimum at 180 °F.
 - 3. End Connections: Solder-joint copper alloy and threaded ferrous.

2.7 GAS PIPING SPECIALTIES

- A. Line Pressure Regulators: Soft valve seat to permit bubble tight lock up under no-flow conditions.
 - 1. Comply with ANSI Z21.18.
 - 2. Body and Diaphragm Case: Die-cast aluminum or cast iron.
 - 3. Springs: Zinc-plated steel; interchangeable.
 - 4. Diaphragm Plate: Zinc-plated steel.
 - 5. Seat Disc: Nitrile rubber.
 - 6. Orifice: Aluminum; interchangeable.
 - 7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
 - 8. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150% of design discharge pressure at shutoff.
 - 9. Overpressure Protection Device: Factory mounted on pressure regulator.
- B. Appliance Flexible Connectors:
 - 1. Indoor, Appliance Flexible Connectors: Comply with ANSI Z21.24 (fixed appliance) or with ANSI Z21.69 (moveable appliance).
 - 2. Corrugated stainless-steel tubing with polymer coating.

3. Operating-Pressure Rating: 0.5 psig.
4. End Fittings: Zinc-coated steel, threaded ends.
5. Maximum Length: 72 inches.

PART 3 - EXECUTION

3.1 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
- B. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- C. Install piping to permit valve servicing and free of sags and bends.
- D. Install press fittings with a minimum spacing of 1" between fittings.
- E. Select system components with pressure rating equal to or greater than system operating pressure.
- F. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- G. Install drains, consisting of a tee fitting, 3/4" ball valve, and short 3/4" threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- H. Install unions or flanges in piping, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- I. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- J. Install 3/4" nipple and ball valve in blowdown connection of strainers 2" and larger. Match size of strainer blowoff connection for strainers smaller than 2".
- K. Install escutcheons (chrome plates) for exposed piping penetrations of finished walls, ceilings, and floors.

3.2 GENERAL GAS PIPING INSTALLATION:

- A. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.
 1. Construct sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 6 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- B. Connect to existing or extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- C. Connect branch piping from top or side of horizontal piping.
- D. Install unions in pipes 2" and smaller, adjacent to each valve, at final connection to each piece of equipment.
- E. Do not use natural-gas piping as grounding electrode.

- F. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- G. Install fittings for changes in direction and branch connections.
- H. Install piping adjacent to appliances to allow service and maintenance of appliances.
- I. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

3.3 NATURAL GAS PIPING INSTALLATION:

- A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Connect to existing gas piping where shown on the Drawings.
- C. Install natural-gas piping electrically continuous and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
 - 1. Corrugated stainless steel tubing (CSST) shall be bonded to the electrical service grounding electrode system. The bonding jumper shall connect to a metallic pipe or fitting between the point of delivery and the first downstream CSST fitting. The bonding jumper shall not be smaller than 6 AWG copper wire or equivalent.

3.4 HANGERS AND SUPPORTS

- A. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 50 feet long.
 - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 50 feet or longer.
 - 3. Install trapeze hanger for multiple parallel piping 50 feet or longer.
 - 4. Spring hangers to support vertical runs.
 - 5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
 - 6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.
 - 7. Install hanger 12" from elbow joint.
- B. Install hangers for steel piping as follows:
 - 1. 1" and smaller: 8 feet with 3/8-inch rod.
 - 2. 1-1/4" to 3": 10 feet with 3/8-inch rod.
 - 3. 4" to 6": 12 feet with 1/2-inch rod.
 - 4. 8" and larger: 12 feet with 5/8-inch rod.
- C. Install hangers for drawn-temper copper piping as follows:
 - 1. 1-1/2" and smaller: 6 feet with 3/8-inch rod.
 - 2. 2" to 4": 10 feet with 3/8-inch rod.
 - 3. 6" and larger: 10 feet with 1/2-inch rod.

- D. Install hangers for PVC as follows:
1. 1" and smaller: 3 feet with 3/8-inch rod; 8 feet with pipe support channel and 3/8" rod.
 2. 1-1/4" to 3": 4 feet with 3/8-inch rod; 8 feet with pipe support channel and 3/8" rod.
 3. 4" to 6": 4 feet with 1/2-inch rod; 10 feet with pipe support channel and 1/2" rod.
 4. 8" and larger: 4 feet with 5/8-inch rod; 10 feet with pipe support channel and 5/8" rod.
- E. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

3.5 PIPING APPLICATIONS

- A. Piping materials are identified below. If more than one material is listed for an application, selection from materials listed is Contractor's option.
- B. Hot-water heating piping, aboveground, 2" and smaller:
1. Type L or Type M, drawn-temper copper tubing; wrought-copper solder-joint fittings, or pressure-seal-joint fittings.
 2. Schedule 40 steel pipe; Class 125, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
 3. Schedule 40 steel pipe; Class 125, cold press mechanical-joint fittings.
- C. Hot-water heating piping, aboveground, 2-1/2" and larger:
1. Type L or Type M, drawn-temper copper tubing; wrought-copper solder-joint fittings, and copper pressure-seal-joint fittings for up to 4".
 2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
 3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
- D. Condensate-Drain Piping:
1. Type M, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
 2. Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.
- E. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
- F. Natural Gas Piping: Black steel, Schedule 40, Type E or S, Grade B.
1. Malleable-iron threaded fittings or wrought-steel welding fittings: 2" or smaller.
 2. Cold Press Mechanical-Joint Fittings:
 - a. 2" or smaller.
 - b. Systems with gas pressure 5 psi and lower.
 3. Welded Fittings:
 - a. Systems with gas pressure 2 psi and higher.
 - b. Piping larger than 2".
 - c. Piping in inaccessible areas.
 4. Unions: Malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 5. Corrugated stainless-steel tubing may be used at following locations:
 - a. From drip leg tee to equipment, 1" or smaller.

- b. Inaccessible locations, 1-1/2" or smaller, 75' maximum length.
- c. Where noted on drawings.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes:
 - 1. Chemical treatment.
 - 2. Water flow control devices.
 - 3. Air control devices.
 - 4. Strainers.
 - 5. Gauges (temperature, pressure).
 - 6. Thermowells.
 - 7. Gauge attachments.

1.2 SUBMITTALS

- A. Shop Drawings: For equipment covered under this section as per Section 230500.
 - 1. Product Data: For each type of the following:
 - a. Chemical treatment.
 - b. Gauges, strainers,
- B. Operation and Maintenance Manuals: For equipment covered under this section as per Section 230500.
 - 1. Product Data: Flow control valves, gauges, and strainers.

1.3 QUALITY ASSURANCE

- A. All equipment shall be installed in a workmanlike manner by skilled workmen regularly engaged in this type of work.

PART 2 - PRODUCTS

2.1 CHEMICAL TREATMENT

- A. Bypass Chemical Feeder and Filter: Single package for chemical addition and filtering. Steel body and pleated filter.
 - 1. Manufacturers: Subject to compliance with requirements, provide glycol by one of the following or other prior approved:
 - a. J.L. Wingert Company.
 - 2. Basis of Design: J.L. Wingert Company model PF-DB-2HD.
 - 3. Style: 2 gallon capacity, dome bottom; 3/4" side inlet and outlet with shut-off valves; bottom drain; welded steel legs.
 - 4. Materials: Welded steel construction, interior and exterior epoxy coated; 125-psig working pressure.
 - 5. Filter: Pleated type, 20 micron capability; stainless steel holder.
 - 6. Accessories:
 - a. Internal and external epoxy coating.
 - b. Air release

- c. Sight flow indicator equal to Bell and Gosset model TB-3/4 Thermoflo Balancer with minimum range of 1 to 5 gpm.
 - d. Flow control
 - e. 3 extra filters for turnover to owner at end of project.
- B. Ethylene Glycol: Industrial grade with corrosion inhibitors and environmental-stabilizer additives for mixing with water in systems indicated to contain antifreeze or glycol solutions.
1. Glycol Manufacturers: Subject to compliance with requirements, provide glycol by one of the following or other prior approved:
 - a. Dow Chemical.
 - b. Houghton Chemical Corporation.
 - c. JEFFCOOL.
 2. Mixture Percentage: 50%.
 3. Water used to dilute glycol:
 - a. Maximum Concentrations: Chlorides, 25 ppm; Sulfates, 25 ppm; Calcium, 50 ppm; Magnesium, 50 ppm.
 - b. Total Hardness: Less than 100 ppm.
 - c. Provide water test results to engineer prior to filling the system.
 - d. If any of the above categories are exceeded, the Contractor shall use a factory premixed water/glycol solution or obtain distilled or deionized water to dilute the glycol to the strength specified.

2.2 WATER FLOW CONTROL DEVICES

- A. Balancing Valves – Calibrated-Orifice Ball Valve:
1. Basis of Design: Watts CSM-61.
 2. Body: Bronze, ball type with calibrated orifice.
 3. Ball: Brass or stainless steel.
 4. Seat: PTFE.
 5. Pressure Gage Connections: Integral seals for portable differential pressure meter.
 6. Handle Style: Lever, with memory stop to retain set position.
 7. Chained Metal Tag: Required.
 8. CWP Rating: Minimum 125 psig.
 9. Maximum Pressure Drop: 48”.
- B. Balancing Valves – Venturi Ball Valve:
1. Description: Combination ball valve and fixed venturi with ports.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 - a. Gerand.
 - b. Nexus.
 3. Basis of Design: Gerand Balvalve Venturi Style BVT or BVS.
 4. Valve Body: Brass body, chrome plated brass ball.
 5. Valve Seat: PTFE.
 6. Rating: 125 psi CWP.
 7. Handle Style: Lever, with memory stop to retain set position.
 8. Chained Metal Tag: Required.
 9. Venturi Body: Brass.

10. Pressure Gage Connections: Integral seals for portable differential pressure meter.
11. Maximum Pressure Drop: 48”.

C. Balancing Device – Venturis:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 - a. Gerand Engineering Co.
 - b. PRO Hydronic Specialties.
2. Body: Compatible with connected piping.
3. Pressure Gage Connections: Integral seals for portable differential pressure meter.
4. Chained Metal Tag: Required.
5. CWP Rating: Minimum 250 psig.
6. Maximum Pressure Drop: 48”.

2.3 AIR CONTROL DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:

1. Amtrol, Inc.
2. Armstrong Pumps, Inc.
3. Bell & Gossett Domestic Pump; a division of ITT Industries.
4. Niles Steel Tank.
5. Taco.

B. Manual Air Vents: Rated for 150 psi at 225°F; with extended tube.

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.

C. Automatic Air Vents: Rated for 150 psi at 225°F.

1. Basis of Design: Taco Hy-Vent.
2. Body: Nickel-plated Brass.
3. Operator: Float.

D. Expansion Tanks:

1. Standard: ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.
2. Body: Welded steel, rated for 125 psi at 240°F.
3. Taps: Air charge and drain.
4. Air Separator: Heavy-duty butyl rubber diaphragm or removable bladder as scheduled.

E. Air Purger: Rated for 150 psi at 225°F; with bottom tapping for installation of expansion tank and top tapping for vent.

1. Basis of Design: Taco Air Scoop.
2. Body: Cast iron.
3. Integral Closeable Vent: Contractor option.

F. Tangential Air Separator:

1. Basis of Design: B & G Rolairtrol® Series.

2. Standard: ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.
3. Tank: Steel, rated for 125 psi at 240°F, with taps for blowdown and vent connections.
4. Strainer: Removable, not less than 5 times the open area of the nozzle; stainless steel with 3/16" diameter perforations.

2.4 STRAINERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 1. Armstrong International.
 2. Bell & Gossett.
 3. Metraflex Company (The).
 4. O.C Keckley Company.
 5. Titan Flow Control.
 6. Victaulic.
- B. Body: Brass with threaded screen retainer for 2" and smaller; cast iron rated for 125 psig with bolted cover and bottom drain connection for 2-1/2" and larger.
- C. End Connections: Threaded ends for 2" and smaller; flanged ends for 2-1/2" and larger.
- D. Strainer Screen: 20-mesh brass or stainless steel for 2" and smaller; 3/64" perforated stainless steel for 2-1/2" and larger.

2.5 GAUGES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 1. Miljoco Corporation.
 2. Terice, H. O. Co.
 3. Weiss Instruments, Inc.
 4. WIKA Instrument Corporation - USA.
 5. Winters Instruments - U.S.
- B. Thermometers – 6" Industrial-Style, Liquid-in-Glass:
 1. Basis of Design: Weiss Instruments model HW5A2.
 2. Case: Plastic or cast aluminum; 6-inch nominal size.
 3. Case Form: Adjustable angle.
 4. Tube: Glass with magnifying lens and blue or red non-toxic liquid.
 5. Tube Background: Permanent scale markings graduated in deg F.
 6. Stem: Brass or Aluminum and of length to suit installation.
- C. Thermometers – Digital:
 1. Basis of Design: Terice SX9 Solar Therm series.
 2. Case: Hi-impact plastic or cast aluminum.
 3. Case form: Adjustable angle.
 4. Display: 1/2" LCD digits, wide ambient formula
 5. Power Source: Integral solar cell.
 6. Min/Max Feature: Button to recall minimum and maximum temperatures over a given period; resettable.

D. Pressure Gages – Dial Type:

1. Basis of Design: Weiss Instruments 4UG series.
2. Standard: Conform to ASME B40.100.
3. Case: Cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: White aluminum with scale markings graduated in psi.
7. Scale: Select so expected pressure reading is in center of range.

E. Pressure Gages – Digital:

1. Basis of Design: Weiss Instruments DUGY3 Series.
2. Standard: Conform to ASME B40.100.
3. Case: Glass reinforced plastic; 4-1/2-inch nominal diameter.
4. Sensor: Gold-plated ceramic.
5. Wetted Materials: Stainless Steel.
6. Power: Solar cell.
7. Display: 5/8" high.
8. Accuracy: 0.5% full scale.
9. Ranges: Select so upper limit is two times expected average reading.
10. Ambient Operating: 10°F to 140°F.

F. Gauge Accessories:

1. Thermowells:
 - a. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
 - b. Lagging Extension: Include on thermowells for insulated piping and tubing.
 - c. Heat-Transfer Medium: Mixture of graphite and glycerin.
2. Snubbers: Brass; piston or porous-metal-type surge-dampening device. Include extension for use on insulated piping.
3. Siphons (Pigtail): Loop-shaped section of brass or steel pipe.
4. Valves: Brass ball, threaded.

PART 3 - EXECUTION

3.1 CHEMICAL TREATMENT INSTALLATION

- A. Install bypass chemical feeders in each hydronic system where indicated, in upright position with top of funnel not more than 48 inches above the floor. Install feeder in minimum 3/4" bypass line, from main with full-size, full-port, ball valve in the main between bypass connections. Install 3/4" pipe from chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.
- B. Replace filter in bypass chemical feeder at project closeout. Turn over extra filters to owner.
- C. Clean system as outlined in Section 230500.
- D. Add initial chemical treatment and maintain water quality in ranges noted above for the first year of operation.
- E. Fill systems indicated to have glycol solutions with the concentrations noted on the Drawings.

- F. After the glycol water solution is circulated for a minimum of 10 hours, the Contractor shall test the solution for freeze point and reserve alkalinity (inhibitor level). The fluid analysis kit shall be obtained from the manufacturer of the glycol. In lieu of the self-test kit, the Contractor may send a sample to the manufacturer for analysis. A copy of the report shall be furnished to the Engineer.
- G. If freeze point or concentration is less than specified, the Contractor will add sufficient glycol to obtain specified mixture.
- H. If reserve alkalinity is lower than recommended by the manufacturer, the Contractor shall add sufficient inhibitor to obtain minimum recommended level of protection.
- I. Contractor shall attach a tag near the system fill connection indicating manufacturer name, brand name/number and protection level (°F) of the Glycol water solution.

3.2 WATER FLOW CONTROL DEVICE INSTALLATION

- A. Calibrated Orifice Ball Valves or Venturis Ball Valves: 2" and smaller piping.
- B. Venturis Balancing Devices: 2-1/2" and larger piping. Provide a separate valve for shut off purposes.
- C. Furnish with chained metal tag showing location, size, GPM, and meter reading.

3.3 AIR CONTROL DEVICE INSTALLATION

- A. Install manual air vents on air chamber at the high point of all piping and in the return piping at all heating units.
- B. Install float type automatic air vent with ball valve on top of air purgers if integral vent is not provided. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
- C. Air separator and expansion tank to be installed on the suction side of the system pumps.
- D. Provide valved drain and hose connection on strainer blow down connection.
- E. Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks. Pipe relief valve outlet to nearest floor drain.

3.4 GAUGE INSTALLATION

- A. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
 - 1. Install thermowells with extension on insulated piping.
 - 2. Fill thermowells with heat-transfer medium.
- B. Adjust faces of meters and gages to proper angle for best visibility.
- C. Install valve and snubber in piping for each pressure gage for fluids.
- D. Install valve and siphon fitting in piping for each pressure gage for steam.

3.5 FLOW CONTROL SCHEDULE

- A. Install calibrated-orifice, balancing valves at return connection to each heating unit, each coil, and where shown on drawings.

3.6 HEATING AND COOLING FLUID SCHEDULE

- A. Heating Fluid:
 - 1. Boiler System: 100% water.
 - 2. Combustion Air System: 50% ethylene glycol.

3.7 THERMOMETER SCHEDULE

- A. Install thermometers in the following locations:
 - 1. Inlet and outlet of each hydronic boiler.
 - 2. Inlet and outlet of each hydronic coil.
 - 3. Two inlets and two outlets of each hydronic heat exchanger.
- B. Heating, Hot-Water Piping: 0 to 250°F.

3.8 PRESSURE GAUGE SCHEDULE

- A. Install pressure gages in the following locations:
 - 1. Suction and discharge of each pump.
- B. Scale Range for Pump Gauges: 0 to 100 psi.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Hydronic pumps.
 - 2. Pump specialty fittings.

1.2 SUBMITTALS

- A. Shop Drawings: For equipment covered under this section as per Section 230500.
 - 1. Product Data: Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.
- B. Operation and Maintenance Manuals: For equipment covered under this section as per Section 230500.

1.3 QUALITY ASSURANCE

- A. Motors: Comply with requirements in Section 230510 "Common Motor Requirements for HVAC Equipment."

1.4 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship within specified period.
 - 1. Warranty Period: Not less than one year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Except where otherwise noted, the following pump manufacturers are acceptable:
 - 1. Armstrong Pumps Inc
 - 2. Bell & Gossett; Div. of ITT Industries
 - 3. Grundfos Pumps Corp.
 - 4. Taco, Inc.
 - 5. Thrush Company Inc.
 - 6. Wilo USA LLC
- B. Except where otherwise noted, the following pump specialty fittings manufacturers are acceptable:
 - 1. Armstrong
 - 2. Bell & Gossett; Div. of ITT Industries.
 - 3. Mueller, Victaulic
 - 4. Anvil Gruvlock
 - 5. Taco, Inc.
- C. All manufacturers are subject to compliance with requirements

- D. Provide products by one of the manufacturers specified or by prior approval.

2.2 CAPACITIES AND CHARACTERISTICS

- A. See schedules on the Drawings for pumps listed below.
- B. Pump Ratings: 125-psig pressure and 220 °F temperature, unless otherwise indicated.
- C. Pump Motors: Single speed and rigidly mounted to pump casing with permanently lubricated ball bearings, unless otherwise indicated.
1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 23 0520 “Common Motor Requirements.”
 3. Enclosure: Open, dripproof.

2.3 CIRCULATOR PUMPS – HIGH-CAPACITY

- A. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump; designed for installation with pump and motor shafts mounted horizontally.
- B. Pump Construction:
1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet and threaded companion-flange connections.
 2. Impeller: Non-metallic; statically and dynamically balanced, and keyed to shaft.
 3. Pump Shaft: Stainless steel.
 4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and EPT bellows and gasket. Include water slinger on shaft between motor and seal.
 5. Pump Bearings: Permanently lubricated ball bearings.

2.4 IN-LINE PUMPS – CLOSE-COUPLED

- A. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump; designed for installation with pump and motor shafts mounted horizontally or vertically.
- B. Pump Construction:
1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet and threaded companion-flange connections.
 2. Impeller: ASTM A743, stainless steel; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For constant-speed pumps, trim impeller to match specified performance.
 3. Pump Shaft: Stainless steel, with copper-alloy shaft sleeve.
 4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless-steel spring, and EPT bellows and gasket. Include water slinger on shaft between motor and seal.
 5. Pump Bearings: Permanently lubricated ball bearings.

PART 3 - EXECUTION

3.1 PUMP INSTALLATION

- A. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.
- B. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping or install single gage with multiple-input selector valve.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ducts and fittings.
 - 2. Sheet metal materials.
 - 3. Sealants and gaskets.
 - 4. Hangers and supports.
 - 5. Dampers.
 - 6. Turning vanes.
 - 7. Duct-mounted access doors.
 - 8. Flexible connectors.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

1.3 SUBMITTALS

- A. Shop Drawings: For equipment covered under this section as per Section 230500.
 - 1. Dampers: Make and model, components, materials, drawings with dimensions and field connections.
- B. Operation and Maintenance Manuals: For equipment where shop drawings were submitted this section as per Section 230500.

1.4 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship within specified period.

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on 2" static-pressure class unless otherwise indicated.
- B. Ductwork shall be fabricated in accordance with the following schedule:
 - 1. Up to 12" Width: 26 Gauge
 - 2. Up to 30" Width: 24 Gauge

2.2 SHEET METAL MATERIALS

- A. General Material Requirements: Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 RECTANGULAR DUCT CONNECTION SYSTEM

- A. Description: Roll-formed flanges, corner pieces, gasket and metal cleat.
 - 1. Sealer: Integral mastic meeting NFPA 90A and 90B Class I requirements.
 - 2. Gasket: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
 - 3. Schedule: Rectangular ductwork with perimeter greater than 120”.

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
 - 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 - 2. Tape Width: 4 inches.
 - 3. Water resistant, mold and mildew resistant.
 - 4. Maximum Static-Pressure Class: 6-inch wg, positive and negative.
 - 5. Service: Indoor and outdoor.
 - 6. Service Temperature: Minus 20 to plus 200 °F.
 - 7. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
- C. Water-Based Joint and Seam Sealant (Mastic):
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Water resistant, mold and mildew resistant.
 - 4. Maximum Static-Pressure Class: 6-inch wg, positive and negative.
 - 5. Service: Indoor or outdoor.
 - 6. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C 920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. Type S, grade NS, class 25, use O.

- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- F. Round Duct Joint O-Ring Seals:
 - 1. Seal shall provide maximum 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.

2.5 DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 - 1. Cesco Products; a division of Mestek, Inc.
 - 2. Greenheck Fan Corporation.
 - 3. NCA Manufacturing, Inc; Metal Industries, Inc.
 - 4. Nailor Industries Inc.
 - 5. Pottorff.
 - 6. Ruskin Company.
 - 7. Vent Products Company, Inc.
- B. Backdraft Dampers - Rectangular:
 - 1. Description: Gravity balanced.
 - 2. Up to 2" wg. System Pressure:
 - a. Frame: 0.125"-thick extruded aluminum.
 - b. Blades: Multiple single-piece blades, maximum 6-inch width, 0.050"-thick aluminum with sealed edges.
 - 3. Blade Action: Parallel.
 - 4. Blade Seals: Felt or Vinyl foam for silent operation.
 - 5. Blade Axles: Aluminum.
 - 6. Accessories: Adjustment device to permit setting for varying differential static pressure.
- C. Manual Volume Dampers:
 - 1. Standard, Galvanized Steel, Manual Volume Dampers:
 - a. Suitable for horizontal or vertical applications.
 - b. Single blade, or multiple, opposed-blade design.
 - 2. Adjustable quadrants or regulators: Plainly marked to indicate position of damper, with locking nut.
- D. Control Dampers:
 - 1. Furnished under Section 230900, installed by Division 23 except where otherwise noted.
 - 2. AMCA-rated; galvanized-steel or extruded-aluminum frames with holes for duct mounting; damper blades shall not be less than 16 ga. galvanized steel with maximum blade width of 6 inches and length of 48 inches.
 - a. Secure blades to zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
 - b. Operating Temperature Range: From -40°F to 200°F.

- c. Edge Seals, Standard Pressure Applications: Closed-cell neoprene.

2.6 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
1. Ductmate Industries, Inc.
 2. SEMCO Incorporated.
 3. Tuttle & Bailey.
 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

2.7 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Either of the following:
1. Factory fabricated with a fabric strip not less than 6" wide attached to two strips of metal compatible with connected ducts.
 2. Field fabricated with a fabric strip not less than 6" wide clamped to duct by 1"x1"x1/8" angles attached with 5/16 bolts or self-tapping screws, 6" on center.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
1. Minimum Weight: 26 oz./sq. yd..
 2. Service Temperature: Minus 40 to plus 200 °F.
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
1. Minimum Weight: 24 oz./sq. yd..
 2. Service Temperature: Minus 50 to plus 250 °F.

PART 3 - EXECUTION

3.1 DUCTWORK INSTALLATION

- A. Ductwork shall be run as high as possible in all rooms to maintain proper headroom. Where two or more ducts cross each other, they must be arranged in such a manner as to maintain the greatest possible clearance underneath.

- B. Ductwork shall not cover any electrical outlets or junction boxes. Consult with other trades to avoid interference with piping runs, etc.
- C. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- D. Ducts shall conform to dimensions on the Drawings unless location of structural members prohibit. Make minor changes in run of certain ducts without extra cost to the Owner if necessary to avoid unforeseen structural or other interferences.
- E. In case of a change in dimension, cross-sectional areas shall be maintained. Changes in size throughout shall be of perfect rectangular cross sections with a slope of approximately 1 to 4. Abrupt changes or offsets will not be accepted.
- F. All ducts shall be straight and smooth on the inside with finished joints. No inside standing seams will be permitted in ductwork. No single thickness partitions shall be allowed between ducts. The Engineer reserves the right to order any open seams or joints made tight by caulking or taping. No open joints at corners or elsewhere will be allowed.
- G. Where space permits, elbows shall have a centerline radius equal to 1½ times their width. Shorter radius and square throat elbows shall be used where required to fit restricted areas only and where required by the duct connection details on the Drawings. All short radius and square throat elbows shall be provided with turning vanes.

3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, and seal levels specified in "Duct Schedule" Article.
- B. Leakage Class Definition: Leakage class of 6 means that 6 cfm of leakage per 100 sq ft of duct surface is the maximum allowable threshold if tested at 1 inch test pressure.
- C. Duct Seal Levels Definitions:
 - 1. Level A: All transverse joints, longitudinal seams, and duct wall penetrations. Pressure sensitive tape shall not be used as the primary sealant, unless it has been certified to comply with UL-181A or UL-181B and the tape is used in accordance with that certification.
 - 2. Level B: All transverse joints, and longitudinal seams. Pressure sensitive tape shall not be used as the primary sealant, unless it has been certified to comply with UL-181A or UL-181B and the tape is used in accordance with that certification.
 - 3. Level C: Transverse joints only.

3.3 CONNECTIONS

- A. Make connections to inlet and outlet of all fans with flexible connectors.
 - 1. Exception: Fan housings that have the entire fan and motor assembly isolated for vibration.

3.4 ACCESS DOOR INSTALLATION

- A. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. Downstream from control dampers and backdraft dampers.

- B. Label access doors according to Section 230510, Article "Equipment and Warning Labels" to indicate the purpose of access door.

3.5 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect locations of access doors and verify that purpose of access door can be performed.

3.6 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
- B. Supply Ducts:
 - 1. Pressure Class: Minimum of 0.25-inch wg. greater than scheduled static pressure of attached supply fan.
 - 2. Duct seal levels for pressure class up to 2-inch w.c.:
 - a. Outdoor: A
 - b. Unconditioned Spaces: B
 - c. Conditioned Spaces: C
 - 3. Duct seal levels for pressure class greater than 2-inch w.c.:
 - a. Outdoor: A
 - b. Unconditioned Spaces: A
 - c. Conditioned Spaces: B
- C. Intermediate Reinforcement:
 - 1. Reinforcement:
 - a. Angle type: 1-1/2" x 1-1/2" x 1/8" thick.
 - b. Zee type: 1" (h) x 3/4" (w) x 1/8" thick
 - c. Channel type: 1-1/8" (h) x 3" (w) x 1/8" thick
 - 2. Spacing: 5 feet
 - a. Up to 1" static: Ducts and plenums over 60".
 - b. Up to 3" static: Ducts and plenums over 48".
 - c. Over 3" static: Ducts and plenums over 36".
- D. Elbow Configuration:
 - 1. Rectangular Duct, Elbow:
 - a. Supply: Mitered with vanes.
 - b. Return: Mitered with vanes where indicated.
 - 2. Rectangular Duct, Radius:
 - a. No Vanes: Minimum radius is equal to duct width.
 - b. With Vanes: Minimum radius is equal to 1/2 of duct width.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Boilers
 - 2. Boiler controls.
 - 3. Gas appliance venting.

1.2 SUBMITTALS

- A. Shop Drawings: For equipment covered under this section as per Section 230500.
 - 1. Product Data: Submit capacities and accessories included with boiler. Include general layout, dimensions, size and location of water, fuel, electric, air inlet and vent connections, electrical characteristics, weight and mounting loads. Provide wiring diagrams that are specific to this project.
- B. Operation and Maintenance Manuals: For equipment covered under this section as per Section 230500.
 - 1. Include boiler start-up reports.

1.3 QUALITY ASSURANCE

- A. Provide services of manufacturer's authorized and factory-trained representative to perform the following functions:
 - 1. Inspect and verify installation.
 - 2. Checkout and startup/supervision. Submit startup report.
- B. ASME Compliance: ASME Section IV and UL 795.
 - 1. The boiler shall bear the ASME "H" stamp and be National Board Listed for 160 psi working pressure and 250°F.
- C. Gas Train and Safety Controls: Conform to requirements of UL 795 and CSD-1.

1.4 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship within specified period.
 - 1. Warranty Period: Not less than one year from the date of Substantial Completion.
- B. Water-Tube Non-condensing Boilers:
 - 1. Heat Exchanger: 5-year limited warranty, and a 20-year warranty against thermal shock: cover defects in materials or workmanship and failure due to thermal shock; repair or replace defective heat exchanger.
 - 2. Burner: 10-year limited warranty: cover defects in materials or workmanship; repair or replace defective burner.
- C. Electric Boilers:
 - 1. Vessel: 5-year limited warranty.

PART 2 - PRODUCTS

2.1 BOILERS – NON-CONDENSING

- A. Description: Packaged, modulating, power-vented, gas-fired boiler with copper-finned water-tube heat exchanger, and controls.
 - 1. Certification: ASME “H” stamp.
 - 2. Factory fire-tested.
- B. Manufacturers: Subject to compliance with requirements, provide products by the following manufacturer or other prior approved equal:
 - 1. Thermal Solutions.
- C. Heat Exchanger: Water-tube.
 - 1. Tubes: Copper, finned; minimum thickness of 0.072”.
 - 2. Headers: Gaskets and o-rings are not acceptable.
 - 3. Combustion Chamber: Stainless steel, sealed, with flame viewport.
- D. Burner: Natural gas, forced draft drawing from gas premixing valve.
 - 1. Material: Ceramic, non-corroding, radiant.
 - 2. Turndown: Minimum 3:1, fully modulated.
- E. Venting and Combustion: Fully sealed, direct vent capable of sidewall or roof termination.
 - 1. Blower: Variable speed centrifugal fan to operate during each burner firing sequence and to prepurge and postpurge the combustion chamber.
 - 2. Combustion Air Filter: Replaceable, 99% efficient; provide dirty filter alarm.
- F. Gas Train: Combination gas valve with manual shutoff and pressure regulator.
 - 1. Ignition: Silicone carbide hot-surface ignition or electric spark-to-pilot ignition that includes flame safety supervision and 100 percent main-valve shutoff.
- G. Casing:
 - 1. Jacket: Sheet metal, with snap-in or interlocking closures.
 - 2. Control Compartment Enclosures: NEMA 250, Type 1A.
 - 3. Finish: Primed and painted.
 - 4. Combustion-Air Connections: Inlet and vent duct collars.
- H. Boiler Trim:
 - 1. Safety Relief Valve: ASME rated set at 65 psig.
 - 2. Pressure and Temperature Gage: Operating-pressure and -temperature ranges so normal operating range is about 50 percent of full range.
 - 3. Low flow protection.
 - 4. Adjustable high limit temperature controller with manual reset.
 - 5. Testable low water cut off switch.
 - 6. Inlet and outlet temperature sensors.
 - 7. Drain Valve: Minimum 3/4” hose-end gate valve.
 - 8. Flue temperature sensor.

2.2 BOILERS – ELECTRIC

- A. Description: UL-listed electric resistance hot water boiler. Factory-fabricated, assembled, and tested, built on a steel base; including insulated jacket; water supply, and return connections; and controls.
- B. Manufacturers: Subject to compliance with requirements, provide products by the following manufacturer or other prior approved equal:
 - 1. Lattner Boiler Company.
- C. Pressure Vessel: Constructed in accordance with the ASME Code, Section IV, and shall be stamped with an “H” stamp. Pressure shall be hydrostatically test and inspected by a third-party inspector and registered with The National Board.
 - 1. Maximum Working Pressure: 150 psig and 250 °F.
- D. Heating elements: Immersion type, removable.
 - 1. Material: Incoloy.
 - 2. Power Density: Maximum 75 watts per square inch.
- E. Electric enclosure and components:
 - 1. Power Distribution Enclosure: NEMA 12 with vents.
 - 2. Wire: Not less than 8 AWG, with insulation minimum rating of 220°F.
 - 3. Fuse or Circuit Breaker: Each heating element.
 - a. Fuses: Indicator type.
 - 4. Magnetic Contactors: Rated for a minimum of 100,000 cycles.
 - 5. Wiring Diagrams: Permanently affixed to inside of power panel door.
 - 6. Disconnect: The boiler supplier shall provide the electrical disconnect for the boiler. The disconnect lugs shall be to terminate 3-500KCMIL Cu conductors in lieu of 6-#3/0 Cu conductors.
- F. Casing:
 - 1. Jacket: 16 gauge steel jacket.
 - 2. Finish: Galvanized and painted or coated with a heat-resistant silicon acrylic enamel.
 - 3. Insulation: Minimum 4" fiberglass blanket.
- G. Water Trim and Controls:
 - 1. Safety Relief Valve: ASME rated set at 65 psig.
 - 2. Pressure and Temperature Gage: Operating-pressure and -temperature ranges so normal operating range is about 50 percent of full range.
 - 3. Testable low water cutoff.
 - 4. Flow switch.
 - 5. Adjustable high limit temperature controller with manual reset.
 - 6. Adjustable operating temperature controller.
 - 7. Drain Valve: Minimum 3/4" hose-end gate valve.

2.3 BOILER CONTROLS – GAS

- A. Controller:
 - 1. Display: Capable of boiler setup, boiler monitoring, and boiler diagnostics, accessible from front.
 - 2. Power Supply: 120/1/60; Include control transformer.
- B. Features: Multiple loop temperature setpoints with individual outdoor air reset curves; pump delay; domestic hot water prioritization; Cascade logic for lead-lag or modulation of up to eight boilers.
 - 1. Archive History: Record all hard lockouts, soft lockouts, sensor faults, sequencer faults. Store minimum of 100 events.
 - 2. Pump Control Capability: Variable speed boiler pump for constant Delta T at all modulation rates; variable speed system pump; domestic hot water pump.
- C. Sequence of Operation: Electric, factory-fabricated and field-installed panel to control burner firing rate and boiler circulator pump in response to building automation signal.
- D. Burner Safety Controls:
 - 1. High Cutoff: Manual reset stops burner if operating conditions rise above maximum boiler design temperature.
 - 2. Testable Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be automatic-reset type.
 - 3. Blocked Inlet Safety Switch: Manual-reset pressure switch field mounted on boiler combustion-air inlet.
 - 4. Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for above conditions.
- E. Building Automation System Interface: Factory install hardware and software to enable building automation system to monitor, control, and display boiler status and alarms.
 - 1. BMS Inputs: 0-10 VDC signal for setpoint; enable-disable; variable system pump signal.
 - 2. BMS Outputs: 0-10 VDC of boiler modulation.
 - 3. Low-voltage Terminal Strip Contacts: Alarm, low water cutoff, flow switch, water tank thermostat, system supply sensor, outdoor air sensor, BMS signal.
 - 4. High-voltage Terminal Strip Contacts: Integral relays; system pump, boiler pump, domestic hot water pump.

2.4 BOILER CONTROLS – ELECTRIC

- A. Controller: Mounted on boiler front.
 - 1. Display: Step indicator lights.
 - 2. On-off switch.
 - 3. Control transformer.
 - 4. Boiler step controller: First on, first off progressive sequencing step control.
 - a. Number of Steps: Determined by number of circuits and boiler kW.
 - 5. Non-fused disconnect.
 - 6. Shunt-trip device.
 - 7. Door interlock.

8. Ground fault.
- B. Sequence of Operation:
 1. Temperature controller shall control progressive sequencing step controller and include a recycling relay to return controller to “OFF” position following power failure.
 2. At 0 °F outside-air temperature, set supply-water temperature at 180 °F; at 60 °F outside-air temperature, set supply-water temperature at 140 °F.
- C. Safety Controls:
 1. Testable Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be automatic-reset type.
 2. Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for above conditions.
- D. Building Automation System Interface: Factory install hardware and software to enable building automation system to monitor, control, and display boiler status and alarms.
 1. A communication interface with building automation system shall enable building automation system operator to remotely control and monitor the boiler from an operator workstation. Control features available, and monitoring points displayed, locally at boiler control panel shall be available through building automation system.

2.5 LISTED VENTING MANUFACTURERS

- A. Except in other Part 2 articles where noted, the following manufacturers are acceptable:
 1. Hart & Cooley.
 2. Heat-Fab, Inc.
 3. Metal-Fab, Inc.
 4. Selkirk Inc.; Selkirk Metalbestos and Air Mate.
 5. Schebler Chimney Systems.
- B. All manufacturers are subject to compliance with requirements.
- C. Provide products by one of the manufacturers specified or by prior approval.

2.6 LISTED SPECIAL GAS VENTS

- A. Description: Single and double-wall metal vents tested according to UL 1738 and rated for 480 °F continuously, with positive or negative flue pressure complying with NFPA 211.
- B. Construction: Inner shell and outer jacket separated by at least a 1-inch airspace.
- C. Inner Shell: ASTM A 959, Type 29-4C stainless steel.
- D. Outer Jacket: Stainless steel.
- E. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.
- F. Installation: See Drawings for locations of single-wall and double wall vents and special installation requirements.

PART 3 - EXECUTION

3.1 INSTALLATION OF LISTED VENTS AND CHIMNEYS

- A. Locate to comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.
- B. Seal between sections of positive-pressure vents according to manufacturer's written installation instructions, using sealants recommended by manufacturer.
- C. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.
- D. Slope breechings down in direction of appliance, with condensate drain connection at lowest point piped to nearest drain.
- E. Lap joints in direction of flow.
- F. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.
- G. Clean breechings internally, during and after installation, to remove dust and debris. Clean external surfaces to remove welding slag and mill film. Grind welds smooth and apply touchup finish to match factory or shop finish.
- H. Provide temporary closures at ends of breechings, chimneys, and stacks that are not completed or connected to equipment.

3.2 VENTING APPLICATION

- A. Listed Special Gas Vents: Near condensing gas appliances.

3.3 BOILER INSTALLATION

- A. Comply with manufacturer's product data, including technical bulletins, product catalog installation instructions
- B. Install this system as indicated on the Installation, Operation and Maintenance Manual (IOM), and contract drawings and install boilers in accordance with manufacturer's instructions.
- C. Equipment Mounting: Install boilers on existing concrete equipment pad.
- D. Install skid plumb and level, to plus or minus 1/16 inch over base.
- E. Maintain manufacturer's recommended clearances around and over equipment, and as required by local Code.
- F. Arrange all electrical conduit, piping, exhaust vent, and air intake with clearances for burner removal and service of all equipment.
- G. Connect exhaust vent to boiler vent connection, size as shown on the Drawings.
- H. Connect full sized air inlet vent to connector on boiler.
- I. Connect fuel piping in accordance with NFPA 54.
- J. Install discharge piping from relief valves and drain valves to nearest floor drain.

3.4 BOILER START-UP

- A. Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.
- B. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- C. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
- D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 DEMONSTRATION

- A. Demonstrate operation and maintenance procedures to owner.

3.6 BOILER VENTING SCHEDULE

- A. Venting System: ASTM A 959, Type 29-4C stainless steel, pipe, vent terminal, thimble, indoor plate, vent adapter, condensate trap and dilution tank, and sealant.
- B. Combustion-Air Intake: Complete system, pipe, vent terminal with screen, inlet air coupling, and sealant.
 - 1. Material: Per manufacturer recommendations.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes following types of hydronic heat exchangers:
 - 1. Brazed plate.

1.2 SUBMITTALS

- A. Shop Drawings: For equipment covered under this section as per Section 230500.
 - 1. Water-to-water heat exchangers:
 - a. Include rated capacities, operating characteristics, and furnished specialties and accessories.
- B. Operation and Maintenance Manuals: For equipment covered under this section as per Section 230500.

1.3 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship within specified period.
 - 1. Warranty Period: Not less than one year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 BRAZED-PLATE HEAT EXCHANGERS

- A. Configuration: Brazed assembly consisting of embossed or pressed stainless-steel plates brazed together and two end plates, one with threaded nozzles and one with pattern-embossed plates.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 - 1. Alfa Laval Inc.
 - 2. Armstrong Pumps, Inc.
 - 3. ITT Corporation; Bell & Gossett.
 - 4. Polaris Plate Heat Exchangers.
 - 5. TACO Incorporated.
 - 6. Tranter, Inc.
- C. Construction: Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels," Division 1.
 - 1. End-Plate Material: Type 316 stainless steel.
 - 2. Threaded Nozzles: Type 316 stainless steel.
 - 3. Plate Material: Type 316 stainless steel.
 - 4. Brazing Material: Copper.

PART 3 - EXECUTION

3.1 WATER-TO-WATER EXCHANGER INSTALLATION

- A. Install brazed-plate heat exchanger on custom-designed wall supports anchored to structure.
- B. Install piping adjacent to heat exchangers to allow space for service and maintenance of heat exchangers. Arrange piping for easy removal of heat exchangers.
- C. Install shutoff valves at heat-exchanger inlet and outlet connections.
- D. Install relief valves on heat-exchanger heated-fluid connection and install pipe relief valves, full size of valve connection, to floor.
- E. Install thermometer on heat-exchanger inlet and outlet piping and install thermometer on heating-fluid inlet and outlet piping.
- F. Install pressure gages on heat-exchanger and heating-fluid piping.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Air coils, hydronic.
 - 2. Blower coil units, ducted.

1.2 SUBMITTALS

- A. Shop Drawings: For equipment covered under this section as per Section 230500.
 - 1. Fan coil units:
 - a. Design Characteristics: Make and model, performance, components, controls, furnished options.
 - b. Physical Characteristics: Quantities, drawings with dimensions, materials, air and hydronic connections.
 - c. Electrical Characteristics: Power requirements, wiring connections for power and controls.
- B. Operation and Maintenance Manuals: For equipment covered under this section as per Section 230500.

1.3 QUALITY ASSURANCE

- A. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- B. Motors: Comply with requirements in Section 230510 "Common Motor Requirements for HVAC Equipment."
- C. Methods of Testing Cooling And Heating Coils: Comply with ASHRAE 33.

1.4 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship within specified period.
 - 1. Warranty Period: Not less than one year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 AIR COILS, HYDRONIC

- A. Manufacturers: Subject to compliance with requirements, provide coils that are not integral part of air handling units by one of the following or other prior approved:
 - 1. Carrier Corporation.
 - 2. Greenheck.
 - 3. McQuay.
 - 4. Trane.
 - 5. USA Coil & Air.
- B. Coils Integral to Equipment: Meet following general requirements unless otherwise noted.

- C. Performance Ratings: Tested and rated according to ARI 410 and ASHRAE 33.
 - 1. Minimum Working-Pressure/Temperature Ratings: 200 psig, 325 °F.
 - 2. Source Quality Control: Factory tested to 300 psig.
- D. Physical Characteristics:
 - 1. Tubes: Copper.
 - 2. Fins: Aluminum, mechanically bonded to tubes.
 - 3. Headers: Drainable and self-venting circuits.
 - 4. Frames: Galvanized-steel channel frame for slip-in or flanged mounting.
 - a. 16 Gauge Material: Headers 33” and less.
 - b. 14 Gauge Material: Headers 34” and larger.

2.2 BLOWER COIL UNITS, DUCTED

- A. Description: Factory-packaged and -tested units rated according to ARI 440, ASHRAE 33, and UL 1995. Unit includes coil, condensate drain pan, motor, and controls in an insulated casing.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 - 1. American Standard.
 - 2. Carrier.
 - 3. Krueger.
 - 4. Lennox.
 - 5. Rheem.
 - 6. Superior Rex.
 - 7. Tempstar.
 - 8. Trane.
- C. Furnished Components:
 - 1. Coil Section Insulation: 1-inch thick, matte-finish, closed-cell foam.
 - 2. Main and Auxiliary Drain Pans: Plastic, removable.
- D. Chassis: Galvanized steel where exposed to moisture, with baked-enamel finish and removable access panels.
- E. Cabinet: Steel with baked-enamel finish in manufacturer's standard paint color.
 - 1. Supply-Air Plenum: Sheet metal plenum finished and insulated to match the chassis.
 - 2. Return-Air Plenum: Sheet metal plenum finished to match the chassis.
 - 3. Mixing Plenum: Sheet metal plenum finished and insulated to match the chassis with outdoor- and return-air, formed-steel dampers.
 - 4. Dampers: Galvanized steel with extruded-vinyl blade seals, flexible-metal jamb seals, and interlocking linkage.
- F. Filters: Pleated Cotton-Polyester Media: 90 percent arrestance and 7 MERV.
- G. Hot-Water Coil: Comply with article “Coils, Hydronic”.
 - 1. Fins spacing: Minimum of 0.1 inch.
 - 2. Manual Air Vent: Include.

- H. Direct-Driven Fans: Double width, forward curved, centrifugal; with permanently lubricated, multispeed motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and painted-steel or galvanized-steel fan scrolls.
- I. Belt-Driven Fans: Double width, forward curved, centrifugal; with permanently lubricated, single-speed motor installed on an adjustable fan base resiliently mounted in the cabinet. Aluminum or painted-steel wheels, and painted-steel or galvanized-steel fan scrolls.
- J. Controls: Include low voltage terminal board and provide controls as specified in Section 230900.
- K. Electrical Connection: Factory wire motors and controls for a single electrical connection.

PART 3 - EXECUTION

3.1 HYDRONIC UNIT INSTALLATION

- A. Comply with manufacturer's product data, including technical bulletins, product catalog installation instructions.
- B. Suspended Units: Suspend from structure using threaded rods, spring or elastomeric hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
- C. Unless otherwise indicated, install union and gate or ball valve on supply-water connection and union and calibrated balancing valve on return-water connection of unit heater.
- D. Install coils and units level and plumb.
- E. Straighten bent fins on water coils.
- F. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- G. Install piping adjacent to coils to allow service and maintenance.
- H. Connect water piping with unions and shutoff valves to allow coils to be disconnected without draining piping.

3.2 HYDRONIC FIELD QUALITY CONTROL

- A. Perform the following electric coil field tests and inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, operate electric coils to confirm proper unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
BOILER REPLACEMENT
BISMARCK, NORTH DAKOTA
COMMISSION NO. 19590

DIVISION 26 – ELECTRICAL

SECTION 260500	COMMON WORK RESULTS FOR ELECTRICAL
SECTION 260505	TEMPORARY FACILITIES & CONTROLS
SECTION 260510	REMODELING WORK
SECTION 260519	CONDUCTORS
SECTION 260526	GROUNDING & BONDING FOR ELECTRICAL SYSTEMS
SECTION 260533	RACEWAYS
SECTION 260534	OUTLET, PULL & JUNCTION BOXES
SECTION 260553	IDENTIFICATION
SECTION 262726	WIRING DEVICES & DEVICE PLATES
SECTION 262813	FUSES
SECTION 262816	ENCLOSED SWITCHES & CIRCUIT BREAKERS
SECTION 262913	MOTOR STARTERS
SECTION 264313	SURGE PROTECTIVE DEVICES
SECTION 266540	CONNECTIONS TO EQUIPMENT

PART 1 – GENERAL

1.1 DESCRIPTION

A. Specification Format

1. These Specifications are written in imperative and abbreviated form. This imperative language of the technical sections is directed at the Contractors, unless specifically noted otherwise. Incomplete sentences shall be completed by inserting "shall", "the Contractor shall", and "shall be", and similar mandatory phrases by inference in the same manner as they are applied to notes on the Drawings. The words "shall be" shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, perform all indicated requirements whether stated imperatively or otherwise.
2. Three Part Format
 - a. "Part 1.00 - General": Covers those areas which relate to the Work, and which define the general administrative and technical requirements specific to a particular section.
 - b. "Part 2.00 - Products": Defines, in detail, the acceptance equipment and materials to be incorporated into the Work.
 - c. "Part 3.00 - Execution": Describes, in detail, the manner in which items covered by Part 2 are to be incorporated into the Work.
3. Where Codes, Specifications and Drawings are in conflict, the Contractor will be deemed to have bid the more expensive method. Refer all such discrepancies immediately to the Engineer prior to commencing related work.

B. Definitions

1. "Furnish" - Supply equipment as required by these Drawings and Specifications, delivered to the job site for installation or use by others.
2. "Install" - Fix in position for total operational use all apparatus as shown, specified or required. Provide all miscellaneous fittings and wiring supplies.
3. "Or Approved Equal" - Equipment or materials selected by Contractor subject to Engineer's acceptance.
4. "Or Equivalent" - Equipment or materials selected by Contractor matching the function and performance of equipment or materials listed.
5. "Provide" - Furnish and install in place, total and operational.
6. "Manufacturer's Representative" – person properly trained/certified for the specific equipment and a regular employee of the Manufacturer, the Manufacturer's Representative Agency, a third party specializing company, or the selling distributor.
7. "Substantial Completion" - The date when the project has been completed, inspected, and accepted by the Engineer and Owner.

C. Work Included

1. Provide labor, equipment and materials in connection with Work specified and shown on Drawings.
2. Work of this Division is subject to requirements of Instructions to Bidders, General Conditions, Supplementary Conditions, Division One, and all other sections of this Specification.

3. Examine site and all Contract documents prior to submittal of bid.

D. Work Installed But Furnished Under Other Directives

1. Provide service for electrically operated equipment not specified in Division 26, 27 & 28. Verify size and locations of such connections by securing all rough-in requirements from the equipment supplier.
2. Equipment requiring electrical service shall be furnished with motors, special controls and remote electrical devices as specified in other Divisions.
3. Verify extent of controls and devices furnished by referring to Divisions where Work is specified.
4. Provide disconnects, starters, control devices, thermal units, fuses, switches and all necessary power and control wiring. Include the installation of remote electrical devices furnished separately with the equipment. Provide identification for remote devices as directed by the Engineer.
5. Contractors of other Divisions providing electrically operated equipment shall verify with the Electrical Contractor the proper voltage and phase before releasing equipment for shipment.
6. Unless otherwise specified, Contractor responsible for furnishing such equipment is also responsible for setting in place.

1.2 ALTERNATES

A. General

1. The work of this Section is affected by the Alternates described in this Specification.

B. Alternate 1

1. The Owner wishes to know in advance the possible cost to provide a 480 kW electric boiler in lieu of the 270 kW electric boiler.
2. Base Bid: Provide connections as shown on the electrical drawings for the 270 kW electric boiler.
3. Under Alternate Bid E-1 on the Bid Form, state the Contract Sum to provide all connections and cabling to a 480 kW electric boiler in lieu of the base bid 270 kW electric boiler. Provide and install new breaker in MDP as shown on the electrical drawings.

1.3 NOT USED

1.4 SUBMITTALS

A. Substitution and Prior Approval to Quote.

1. The reference to manufacturer's name and catalog or model numbers shall be interpreted as establishing a standard of quality, not as limiting competition.

2. Suppliers wishing to price material or equipment not referenced in Specifications or on Drawings shall apply in writing to Engineer for approval to quote. Electronic submittals shall be in PDF format. Include complete descriptive technical data on the proposed item consisting of: model numbers, type, size and performance characteristics. Procedure also applies to requests by Contractor. Self-addressed, stamped envelope required for return reply.
3. The request for prior approval to quote shall be received in Engineer's office no later than 192 hours (eight days) prior to bid opening. All substitute items approved for quotation will be listed in Addenda sent to all planholders in advance of bid opening.
4. Contractors choosing to use material or equipment other than those shown on Drawings or specified in detail, but approved for quotation, shall be responsible for physical dimensions and coordination. Architect, Engineer, or Owner will not be responsible for costs of necessary changes and additional work required by Contractor or any other trades.
5. Substitutions will not be permitted after bid opening.

B. Correspondence

1. Direct all correspondence concerning Division 26, 27, & 28 submittals to:

BRAD GULBRANSON
PRAIRIE ENGINEERING, P.C.
619 RIVERWOOD DRIVE, SUITE 205
BISMARCK, ND 58504
BGULBRANSON@PRAIRIEENGINEERINGPC.COM

C. Shop Drawings

1. Before any of the materials are delivered to the job, submit to Engineer via the Prime Contractor complete Shop Drawings for each item indicated. (Minimum six copies).
2. Include catalog numbers, performance data, dimensions and other descriptive information.
3. Shop Drawings may be in the form of printed catalog sheets showing all necessary information and shall be **completely indexed and tabbed, and be bound in Duo-Tang, Mead or equivalent folders**. Electronic submittals shall be in PDF format organized in similar fashion.
4. Each Shop Drawing folder shall be **stamped, initialed, and dated**, by Prime Contractor to indicate he has thoroughly reviewed them in accordance with General Conditions. Electronic submittals shall include similar cover sheet attachment in PDF format. **Email message text not acceptable.**
5. Shop Drawings not in conformance with Specification will be returned to Prime Contractor without review.
6. Two copies will be retained by Engineer after review and balance will be returned to Prime Contractor.

D. As-Built Drawings

1. Designate one set of clean blueprints at project site as As-Built Drawings. Make As-Built Drawings available to Engineer during project visitation.

2. As work progresses, Contractor's field supervisor shall mark As-Built Drawings in red pencil to indicate actual conditions of installation.
3. Show same general details as Drawings.
4. Give particular attention to marking actual locations of feeders and underground runs.
5. Affix all addendum and change order descriptions to appropriate as-built drawing sheet, utilizing spray adhesive.
6. Submit As-Built Drawings to Engineer along with Record Manuals at close of project.
7. Upon Engineer's review, provide **additional three** photocopies of As-Built Drawings.

E. Record Manuals

1. Upon completion of Work of this Division and as condition of its acceptance, Contractor shall compile three Record Manuals in loose-leaf hardcover binders.
2. List project name, date, Contractor's name, address and telephone number on exterior label of each Record Manual.
3. Include an index sheet indicating each major piece of equipment, supplier and supplier's telephone number. Provide tabbed dividers indicating major groupings of equipment.
4. Record Manual information shall be included for all equipment/material where Shop Drawings are required. **Also include all installation, operation and maintenance data packaged with any equipment.**
5. Turn over to Owner all spare equipment and devices specified and shown. List quantities on Contractor letterhead or invoice, obtain signature of Owner's representative acknowledging receipt, and include with each Record Manual.
6. Include one copy of formal instructional recordings, properly identified as to specification section.
7. Include copy of State Electrical Board Wiring Certificate in each Record Manual.
8. Include service equipment fault current calculation and step-down transformer fault current calculations in Record Manuals. Utility transformer fault current shall be calculated per Section 260553-3.3. Step-down transformer fault current shall be calculated per Section 262200-1.2. Provide in tabular form, as per the following example:

Transformer	kVA	Sec. Voltage	Phase	Impedance	Fault Current	Date Calculated
Utility	300	480	3	1.06%	34,043 amps	11/15/2016
T-1	150	208	3	3.8%	10,958 amps	11/15/2016

9. Calculate the available fault current (AFC) for the mechanical and electrical equipment listed and provide the information in tabular form, utilizing naming convention on the drawings.
 - a. HVAC Equipment 1HP and larger
 - b. Refrigeration Equipment
 - c. Elevator Equipment
 - d. Industrial Control Panels
 - e. Electrical Distribution Equipment
 - f. Branch Panelboards
 - g. MCC's.

10. Fault Current Table Format Example:

Equipment	Voltage	Phase	AFC at Equip.	Date Calculated
<u>AH-1</u>	480	3	5,289 amps	11/15/2016
<u>CU-1</u>	208	3	2,321 amps	11/15/2016

11. Transformer fault current table and equipment fault current calculation table shall be grouped together in the same tabbed section of the Record Manuals.

1.5 QUALITY ASSURANCE

A. Qualifications of Installers

1. For installation and testing, use only trained licensed and experienced workmen familiar with items required and manufacturer's recommended methods.
2. In acceptance or rejection of installed work, no allowance will be made for lack of skill on the part of the workmen.
3. To the maximum extent possible, retain the same supervisory personnel throughout the duration of the Work.

B. Licenses, Permits, Codes and Standards

1. Materials, workmanship and installation: comply with the latest editions of all applicable codes, local ordinances, industry standards, utility company regulations, insurance carrier requirements and these Specifications.
2. Codes and standards shall include, but not necessarily be limited to, the following:
 - a. Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL)
 - b. National Electrical Code (NEC)
 - c. National Fire Protection Association (NFPA)
 - d. Occupational Safety and Health Act (OSHA)
 - e. State and local wiring standards
 - f. Building and fire codes
3. The more stringent provisions shall govern where provisions of pertinent codes and standards conflict with these Specifications or Drawings. Where Codes, Specifications or Drawings differ with one another, the Contractor will be deemed to have bid the more expensive method. Refer all such discrepancies to the Engineer immediately.
4. Pertinent codes and standards shall not be cited to furnish less than specifically shown or specified.
5. Obtain and pay all permits, inspections, licenses and other charges pertaining to the Work. Upon completion of the Work, furnish proof of acceptance by proper agency having jurisdiction.

1.6 GUARANTEE AND WARRANTY

- A. Unless otherwise modified by other sections of this specification, Contractor shall guarantee materials, workmanship and the proper operation of equipment for a period of one year. Warranty period shall begin at date of substantial completion, or date of specific equipment commissioning, whichever is later. Contractor shall correct all equipment, material and workmanship found to be defective or non-conforming to the contract documents without cost to Owner.
- B. Guarantee shall include trips to the project site by Contractor to adjust electrical equipment as required, ensuring it is operating as intended.
- C. Specified guarantee shall not relieve Contractor from liability arising from improper installation or non-compliance with applicable codes.
- D. Contractor shall include written warranty statement, indicating start and end dates of warranty period. Warranty statement shall be included with each copy of the Record Manuals.

1.7 CHANGES TO CONTRACT

- A. Any required changes to the contract after bid date shall be in accordance with General Conditions/Division 1 and this section. Where any discrepancies between the sections are encountered, the more restrictive section shall apply.
- B. Proposed changes shall be accompanied with complete substantiating documentation.
 - 1. Provide an itemized list of quantities for materials, equipment, and supplies.
 - a. Include unit costs for each item and extended price.
 - b. Include unit labor for each item and extended time.
 - 2. Provide subcontractor proposals that include the same substantiating documentation.
 - 3. Provide quotations from suppliers for any specially ordered equipment.
- C. Material costs shall be actual costs to the Contractor, obtaining the materials through normal supply channels, including trade and quantity discounts. Utilizing “suggested pricing” from national pricing organizations for unit costs shall not be accepted. Upon request, the Contractor or Subcontractor shall submit evidence to substantiate the costs.
- D. Labor units shall be industry accepted standard labor hours to perform one unit of work. If the work is being performed in a location that is not considered to be standard working conditions for that specific task, additional labor shall be itemized.
- E. Labor rates shall be the actual rate paid for the workman category along with associated labor burden. Labor burden shall consist only of the mandatory fringe benefits, labor taxes, and labor insurances as affected by payroll. The Owner reserves the right to reject any labor burden which is inconsistent with other similar contractors or where the fringe benefit cost is in excess of established labor agreements.
- F. Allowable markups for Contractor and Subcontractors
 - 1. Overhead on work performed by own forces: 12% maximum.

2. Profit on work performed by own forces: 10% maximum.
 3. Commission on work performed by Subcontractors: 5% maximum.
 4. Sales tax.
 5. Bond and permit increases where applicable.
- G. No additional markups shall be allowed for:
1. Field and/or office supervision/administration time.
 2. Tool burden.
 3. Shop burden.
 4. Overhead/Profit applied to work performed by others.
- H. Additional costs for travel and subsistence shall only be allowed if the proposal includes a request for extension of the completion date. Furthermore, those costs shall be proportional to the number of working days of the extension.
- I. Subcontractors shall compute their costs in the same manner as the Contractor. Subcontractors are subject to the same markup constraints as described herein.
- J. For changes resulting in credit to the costs, no restocking fees for materials shall be applied by the Contractor or Subcontractors.

1.8 TEMPORARY FACILITIES

- A. Refer to Special Conditions and/or Division 1 for details of temporary facilities.

1.9 APPLICATIONS FOR PAYMENT

- A. Refer to Division 1 "Applications for Payment".
- B. Provide one additional copy, sent directly to the Engineer.
- C. Format and content:
1. When included with the Bid, the following categories shall be indicated on the application for payment:
 - a. Project mobilization.
 - b. Demolition.
 - c. Service & Distribution (all switchgear, panels, transformers, motor control centers, and loose controls/disconnects, installed in place).
 - d. Lighting (all fixtures and lamps, installed in place, including pre-fabricated wiring system).
 - e. Wiring Devices (all switches, receptacles, and plates, except voice-data, installed in place).
 - f. Equipment Connections (HVAC, elevator, food service, etc., connected in place).
 - g. Basic Materials (all conduit, wire, boxes, supports, fittings, grounding materials, except special systems and voice-data cabling systems, installed in place).
 - h. Fire Alarm & Detection (all system equipment, installed in place).

- i. Special Systems (all system equipment and cabling, installed in place, broken out by Specification Section. Examples include Clock and Program, Intercom, Nurse Call, Public Address, Sound Reinforcement, Rescue Assistance, TV Signal Cabling, Architectural and Theatrical Lighting Controls, and the like).
- j. Generator (all system equipment, installed in place).
- k. Voice-Data Cabling Systems (all system equipment, installed in place).

PART 2 – PRODUCTS

2.1 MATERIAL

- A. Material and equipment shall be as shown or specified. Provide material not specifically described but required for a complete and proper installation of the Work, subject to the acceptance of the Engineer.
- B. All material and equipment shall be new when delivered to the job and be listed by a Nationally Recognized Testing Laboratory (NRTL).
- C. Owner will not be liable for material installed in non-compliance with codes, standards, and these Contract Documents.

2.2 PRODUCT HANDLING

- A. Protection
 1. Use all means necessary to protect the materials of this Division before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacements
 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

PART 3 – EXECUTION

3.1 GENERAL

- A. Engineer, Architect, or Owner shall not be responsible for the means, methods, techniques, sequences or procedures of construction selected by Contractor.
- B. Engineer, Architect, or Owner shall not be responsible for safety precautions and programs incidental to work of Contractor.
- C. It is the sole responsibility of Contractor to initiate, maintain, and supervise all safety precautions and programs in connection with the Work.

3.2 SURFACE CONDITIONS

- A. Prior to work of each Section of Division 26, 27, & 28, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- B. Verify that work of this Division may be installed in accordance with all pertinent codes, regulations and standards.

3.3 COORDINATION

- A. Order material in a timely fashion to assure it is on the job site when required.
- B. Coordinate installation of material with schedule of other trades to prevent unnecessary delay in construction schedule.

3.4 DISCREPANCIES, CONSTRUCTION CONFLICTS AND DRAWINGS

- A. Discrepancies
 - 1. Prior to submitting bid, Contractor shall refer any apparent discrepancies or omissions to Engineer for clarification.
 - 2. The Architect, Engineer or Owner will not be responsible for any oral instructions or modifications to the contract documents prior to opening of bids.
 - 3. Written interpretation or clarification will be made by Addenda.
- B. Construction Conflicts
 - 1. Conflicts discovered during construction shall be immediately called to the attention of the Engineer for decision.
 - 2. Do not proceed with installation in area of question until conflict has been fully resolved.
 - 3. When so directed by Engineer, Contractor shall make minor adjustment to avoid interferences with other trades. Such minor adjustments shall be performed at no additional cost to the Architect, Engineer or Owner.
- C. Drawings
 - 1. Drawings indicate extent and general layout of electrical systems for project. Due to small scale, it is not possible to indicate all fittings and accessories that may be required. Provide such fittings and accessories as required to form a complete and operating system in general conformance with Specifications and Drawings.
 - 2. Data indicated on Drawings and in these Specifications is as exact as could be secured, but absolute accuracy is not guaranteed.
 - 3. Exact locations, distances, levels and other conditions will be governed by the structure. Field measurements shall take precedence over the Drawings. Use the Drawings and these Specifications for guidance. Secure the Architect's approval for all changes in locations.
 - 4. Verify all measurements at site. No compensation will be made because of difference between locations shown on the Drawings and measurements at the building.

5. Refer to the architectural drawings for dimensions and locations of walls, partitions, doors, windows, ceiling heights, door swings and other details of construction.

3.5 UNDERGROUND UTILITIES

- A. Locations of existing underground utilities are based on available site information and are shown approximately. Contractor shall determine exact utility locations before commencing work and shall be responsible for repair of damages resulting from his construction activities.
- B. Trench and backfill for installation of underground conduits to depth shown or required. Remove any accumulated water in excavation by pumping. Shore and brace excavation as required by safety regulations. Provide temporary bridges to maintain normal traffic flow. Excavation and backfill required by electrical installations shall be accomplished in accordance with Earthwork Specifications by this Contractor.

3.6 CUTTING AND PATCHING

- A. Carefully lay out all work in advance to minimize cutting, channeling or drilling.
- B. Where necessary, all such cutting and patching shall be done in a manner approved by Architect.
- C. Restore damaged surfaces to their original condition by skilled mechanics of the trade involved. Contractor at fault shall assume all cost.
- D. Use only rotary type drilling tools to cut concrete.
- E. Do not endanger the stability of the structure. Do not at any time cut or alter work of any other Contractor without Architect's consent.

3.7 TESTS

- A. Perform all tests as required by Engineer during construction and as described in other Sections of these Specifications.
- B. Testing of entire installation shall be completed before final inspection.

3.8 INSTRUCTIONS

- A. After all required approvals of the Work have been obtained; demonstrate the operation and maintenance of all electrical equipment to the Owner's personnel.
- B. Provide written and oral operating and maintenance instructions to Owner's representatives. The oral instructions shall be given before the Owner occupies the buildings. Instructions to include all building's electrical systems and equipment.
- C. Copies of written operating and maintenance instructions shall be included with each Record Manual.

- D. Electrical Contractor shall coordinate with Owner at Owner's convenience, formal instruction time for contractor personnel to instruct Owner's Representatives on all equipment. Provide similar equipment supplier's instructions where specified thus. Formal instruction to occur with each Record Manual, being referenced to and a part of the Manual.
- E. Formal instructions shall be recorded when required by other Sections of this Specification by this Contractor. Format shall be digital media capable of being played on Windows or Mac operating systems, or shall be submitted on DVD. Digital media may be submitted on a flash drive that is rendered un-writable after the video instructions have been uploaded.

3.9 CLEAN UP

- A. Remove all scrap material left on job during and after installation of Work.
- B. All equipment having finished paint surfaces shall be examined upon completion for scratches and other damage. Touch up all surfaces as required with paint of color to match factory finish.
- C. Perform all cleaning as required by other Sections of Division 26, 27, & 28.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Temporary electricity.

1.2 PRODUCT HANDLING

A. Protection

1. Use all means necessary to maintain temporary facilities and controls in proper and safe condition throughout the progress of Work.

B. Replacements

1. In the event of loss or damage, immediately make all repairs and replacements necessary at no additional cost to Owner.

PART 2 – PRODUCTS

2.1 UTILITIES

A. Temporary Facilities

1. General: all costs, including utility company charges, required for the performance of temporary electrical system, shall be paid by Electrical Contractor.
2. Energy charges: Refer to Division 1 for requirements.
3. Temporary Electricity: Electrical Contractor shall:
 - a. Furnish and install all necessary temporary wiring.
 - b. Provide area distribution boxes located so the individual trades may use their own construction type extension cords.
 - c. Provide GFCI protection on all temporary power per NEC.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide work in remodeled area as shown on Drawings and Specifications.

B. Existing Conditions

1. Visit existing buildings before submitting bid and become familiar with all pertinent existing conditions. Make allowance in bid for all pertinent existing conditions. No Change Orders will be issued:
 - a. For Contractor's failure to visit site and acquaint himself with existing conditions.
 - b. For any portion of remodeled work necessary for complete installation of systems shown.
 - c. Due to Contractor's lack of understanding of amount of work or difficulty of work involved.

PART 2 – PRODUCTS

2.1 See following sections of this Specification.

PART 3 – EXECUTION

3.1 GENERAL

- A. Wiring in existing building shall remain except as noted on Drawings or specified.
- B. Verify existing conditions relative to work involved and make allowances thereto.
- C. Balance additional loads to existing circuitry between phases.
- D. Furnish a revised, typed panel directory on existing panelboards where circuitry is changed.

3.2 CUTTING AND PATCHING

- A. Carefully lay out all work in advance to minimize cutting, channeling or drilling.
- B. Where necessary, all such cutting and patching shall be done in a manner approved by Architect.
- C. Restore damaged surfaces to their original condition by skilled mechanics of the trade involved. Contractor at fault shall assume all costs.
- D. Use only rotary type drilling tools to cut concrete.
- E. Do not endanger the stability of the structure. Do not at any time cut or alter work of any other Contractor without Architect's consent.

3.3 REMOVAL AND/OR REUSE OF EXISTING MATERIALS AND EQUIPMENT

- A. Remove or relocate existing conduits, wires, equipment, devices or fixtures indicated on Drawings or as required.
- B. Remove any existing non-active voice/data cables including trunk cables, and any other special systems cables in the entirety. Verify with Owner prior to removal.
- C. Remove any existing exposed abandoned raceways, including those above accessible ceiling finishes in their entirety. Verify with Owner prior to removal. Where complete conduit removal is not feasible, cut conduit flush with walls and floors, and patch surfaces.
- D. Provide additional code-mandated supports on any remaining (existing prior to project and located within the remodel area) unsupported raceway systems or communications cabling including fiber optic, voice/data and special systems.
- E. Where existing multi-wire lighting and power branch circuits are modified in any way, it is this Contractor's responsibility to provide additional grounded (neutral) conductors as required between the electrical panelboard and existing circuit devices. Circuit breaker tie-handles are not acceptable. In the event that existing raceways are not properly sized to accommodate the required additional conductors, new raceway shall be installed.
- F. Where the reuse of existing conduits, wires, and devices, or fixtures is permissible, verify that wiring is continuous. Existing outlet or junction boxes shall not be rendered inaccessible by structural changes made to the building.
- G. Verify that no devices are cut off from power source unless specifically noted.
- H. Existing equipment which is indicated as being removed and not indicated for reuse shall remain the property of the Owner, stored as directed. Remove and dispose any material the Owner does not wish to retain, except fluorescent lamps and ballasts.
- I. Do not break, dump or otherwise destroy removed fluorescent and HID lamps, due to possible mercury contamination. Removed lamps are to be recycled and converted by an EPA-Licensed company regularly engaged in this business, and offering this service in accordance with all EPA, State, and Local Regulations:

Green Lights Recycling, Inc.
10040 Davenport Street NE
Blaine, MN 55449
(800) 208-8340
FAX (763) 785-0453

Luminaire Recyclers, Inc.
2161 University Avenue West, Suite 206
St. Paul, MN 55114
(612) 649-0079
FAX (612) 649-1993

Recycling Center
605 27th Street SE
Minot, ND 58701
(701) 852-3700
FAX (701) 852-1139

or equivalent as selected by the Contractor.

All associated recycling costs shall be included in this Contract. Recycler shall provide Owner with a Certificate of Conversion, indicating Owner's manifested lamps have been properly recycled and converted. Comply with recycler's packing and shipping instructions.

- J. Do not dump or otherwise destroy removed ballasts, due to possible PCB contamination. Removed ballasts are to be destroyed by an EPA Licensed company regularly engaged in this business, and offering this service in accordance with all EPA, State, and Local Regulations:

Green Lights Recycling, Inc.
10040 Davenport Street NE
Blaine, MN 55449
(800) 208-8340
FAX (763) 785-0453

Luminaire Recyclers, Inc.
2161 University Avenue West, Suite 206
St. Paul, MN 55114
(612) 649-0079
FAX (612) 649-1993

Recycling Center
605 27th Street SE
Minot, ND 58701
(701) 852-3700
FAX (701) 852-1139

or equivalent as selected by the Contractor

All associated destruction costs shall be included in this Contract. Recycler shall provide Owner with a Certificate of Destruction, indicating Owner's manifested ballasts have been properly destroyed. Comply with packing and shipping instructions.

- K. Assume existing equipment and fixtures shown to be reused are in good working condition and can be installed without any repairs or, if in unusable condition, notify the Architect for decision. Contractor shall be responsible for any damage by his personnel to equipment in removal or handling.
- L. Provide blank plates as required at existing rough-ins not being re-used.
- M. Clean fixtures and other equipment removed and indicated for reuse. Provide new lamps for reused fixtures.

3.4 CONTINUITY OF SERVICE

- A. Existing building will be in use during construction. Schedule and carry out work for a minimum of inconvenience to the Owner.
- B. All service interruptions shall require a prior approval by Owner. Confine interruptions to the smallest area possible.
- C. Verify that automatically controlled, electrically operated equipment is returned to the same operating condition which existed prior to interruption.

3.5 ASBESTOS

- A. Contractor is assumed to be knowledgeable about Federal, State, and Local requirements with respect to asbestos issues.
- B. Avoid disturbance of any asbestos-containing material (ACM) within the construction area or elsewhere on the site.
- C. Verify with Owner's "Asbestos Survey and Management Plan" the extent (if any) of existing asbestos.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide a complete system of conductors enclosed in a raceway.

1.2 SUBMITTALS

A. Record Drawings

1. Maintain accurate record drawings in accordance with Section 260500.

PART 2 – PRODUCTS

2.1 CONDUCTOR

A. Copper

1. Soft drawn, annealed.
2. Conductivity of not less than 98% pure copper.
3. Insulated for 600 volt service.
4. #10 AWG and smaller: Solid, Type THWN/THHN.
5. #8 AWG and larger: Stranded, Type THWN/THHN.
6. Provide Type USE where required by Code.

B. MC Cable

1. MC cable is not acceptable for use as a wiring method.

2.2 SPLICES

- A. #10 AWG and smaller: Scotchlock Y, R or G as manufactured by 3M Company, or equivalent.
- B. #8 AWG and larger: Compression type, as manufactured by Anderson, Burndy, Thomas and Betts Company, or equivalent.

2.3 LUBRICANT

A. General

1. NRTL-listed.
2. Flame resistant
3. Compatible with conductor insulation.

B. Acceptable Manufacturer

1. As selected by Contractor.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General

1. Install in accordance with Code, product listing, and manufacturer's recommendations.
2. Install wire and cable in Code-conforming raceways after moisture and debris is swabbed from conduit.
3. Refer to system specified for conductor's peculiar to that system.
4. Conductor sizes: Standard AWG, #12 minimum unless otherwise indicated.
5. Fixture taps: minimum #16 AWG.
6. Conductor temperature ratings: Compatible with the equipment to which it is to be connected. Refer to product listing.
7. Make conductor length for parallel feeders identical.
8. Derate ampacities as required for high ambient temperatures or conductor fill.

B. Color

1. Multi-wire (shared neutral) circuits.
 - a. 120/208 volt
 - 1) Phase conductors: Black, red or blue.
 - 2) Grounded conductor (neutral): White.
 - 3) Grounding conductor: Green or bare.
 - b. 277/480 volt
 - 1) Phase conductors: Brown, orange or yellow
 - 2) Grounded conductor (neutral): Gray
 - 3) Grounding conductor: Green or bare.
2. Separate neutral circuits:
 - a. 120/208 volt
 - 1) Phase conductors: Black, red or blue.
 - 2) Grounded conductor (neutral): White with stripe colored to match phase.
 - 3) Grounding conductor: Green or bare
 - b. 277/480 volt
 - 1) Phase conductors: Brown, orange or yellow.
 - 2) Grounded conductor (neutral): Gray with stripe colored to match phase.
 - 3) Grounding conductor: Green or bare
3. Switch legs: Same as phase conductors.
4. 120 volt isolated ground circuits:
 - a. Phase conductor: Orange.
 - b. Grounded conductor (neutral): White with orange stripe.
 - c. Grounding conductor: Green with yellow stripe.

C. Splices

1. Eliminate wherever possible.
2. Made only at outlet or junction boxes.
3. Obtain special permission from Engineer for any splices in feeder conductors.

D. Voltage Drop

1. Increase size of circuit wiring in accordance with NEC 210.19(A)(1), fine print note, No. 4.
2. Use #10 AWG minimum for all home run conductors longer than 75 feet on 120/208/240 systems and 150 feet on 277/480 systems.

3.2 TESTS

- A. After equipment and wiring is installed, and before it is energized, test all power circuits with a megohmmeter for insulation resistance, phase-to-phase and phase-to-ground faults.
- B. Before testing, disconnect all equipment that might be damaged by the test voltages.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Bond and ground all electrical equipment in accordance with National Electrical Code, State/Local Codes, these Specifications, and as shown on Drawings.

B. Description of System

1. The service equipment, conduit systems, supports, cabinets and neutral conductor shall be solidly grounded and bonded in accordance with National Electrical Code to form a permanent effective and continuous grounded system.

PART 2 – PRODUCTS

2.1 GROUND RODS

- A. Steel with a metallically bonded outer layer of electrolytically applied copper.
- B. Minimum 1/2" diameter 10 foot length, unless otherwise indicated.
- C. Sectional rods not permitted.
- D. Manufacturer: ERITECH or equivalent.

2.2 GROUND ROD CLAMPS

- A. Ground rod clamps shall be high strength silicone bronze.
- B. Manufacturer: ERITECH or equivalent.
- C. At Contractor's option, exothermic welding (CADWELD) or impact compression (ERITECH Hammerlock) may be used in place of ground rod clamps.

2.3 WATER PIPE GROUND CLAMPS

- A. Steel U-bolt with bronze saddle.
- B. Manufacturer: Thomas and Betts Company #3900 series or equivalent.

2.4 REBAR GROUND CLAMPS

- A. Bronze alloy construction.
- B. Sized as required by rebar stub out.

- C. Manufacturer: ERITECH #RC series or #EK series as required by local authority. Equivalent products by Thomas and Betts Company acceptable.

PART 3 – EXECUTION

3.1 GENERAL

- A. **Grounding conductors not shown or included on floor plans.**
- B. **When required, increase trade size of raceway accordingly.**
- C. Aluminum not acceptable for use as a grounding conductor.

3.2 SYSTEM GROUNDING

- A. Provide grounding electrode system in accordance with NEC 250.50. If available, each of the items listed in 250.52(A)(1) through (A)(7) shall be bonded together to form grounding electrode system.
- B. Connect grounding electrode conductor to grounded service conductor.
- C. Provide raceway enclosing grounding electrode conductor. If metallic, bond as per NEC 250.64(E). Provide grounding bushing as required complete with jumpers same size as grounding electrode conductor.
- D. To comply with NEC 250.53, provide two ground rods spaced minimum 6'-0" apart.

3.3 EQUIPMENT GROUNDING CONDUCTOR

- A. Non-metallic conduit: Sized in accordance with NEC, except as further modified by this Specification.
- B. Flexible Metal Conduit, Liquidtight Flexible Conduit.
 - 1. Other than for connection of 120 volt recessed luminaires, not acceptable for use as means of grounding.
 - 2. Provide bonding jumper sized in accordance with NEC around all flexible conduits. Use fittings having lugs for termination of jumper.
 - 3. Spiral wrap not acceptable. Lay along surface, secured with cable ties.
 - 4. Bonding jumper maximum length: 6'.
 - 5. Bonding jumper not required where separate equipment grounding conductor is used.
- C. Branch Circuits
 - 1. **Separate equipment grounding conductor required for each raceway.**
 - 2. Size: per NEC 250.122.
 - 3. Bond to grounding bars, junction boxes and luminaire grounding screws.
 - 4. Field-install grounding screw in luminaire if not provided by factory.

D. Feeders

1. **Separate grounding conductor required.**
2. Bond to grounding bars in switchboards, panelboards and motor control centers.
3. Provide grounding bushing at both ends of all feeders utilizing metallic raceway.
 - a. Bond to grounding bars at both ends.
 - b. Size bonding jumpers to match equipment grounding conductor.
4. Feeder Equipment Grounding Conductor Size:
 - a. Size per NEC 250.122.
 - b. Copper equivalent ampacity when aluminum phase conductors utilized.
5. Do not splice grounding conductor.

E. Water Pipe System

1. Bond interior metal water piping per NEC Section 250.104(A) if water pipe system is not used as part of grounding electrode system.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide all conduit systems as shown on Drawings or required by Codes and Specifications.

B. Description of System.

1. Provide code-conforming raceway system for all conductors unless specifically noted otherwise by phrase "not in conduit".

1.2 SUBMITTALS

A. Record Drawings

1. Maintain accurate record drawings for all raceway runs in accordance with Section 260500.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Metallic conduit and tubing: Allied Tube and Conduit, Republic Conduit, or equivalent.

B. Non-metallic conduit: Carlon Schedule 40 or Schedule 80 where required, Allied Tube and Conduit, Cantex Inc., or equivalent.

C. Flexible metal conduit: Aluminum.

D. Liquidtight, flexible metal conduit: Anaconda Sealtite, or equivalent.

E. Fittings

1. Rigid metal conduit: Appleton, Crouse-Hinds, or equivalent. **Pot metal conduit fittings not acceptable.**

2. EMT:

a. **Steel.**

b. Setscrew or watertight as required.

c. Thomas and Betts Company, or equivalent.

d. **Pot metal, "Sock-on" and indenter fittings not acceptable.**

3. Flexible metal conduit: STEEL, Thomas and Betts Company #XC-400 series, or equivalent.

4. Liquidtight flexible metal conduit:

a. **Steel.**

b. Straight or angled as required.

c. Appleton, Thomas and Betts Company or equivalent.

F. Hangers and Supports

1. As required by Codes and Specifications.
2. Raco, Unistrut, or equivalent.
3. ERICO conduit clips, Type 8-M, 12-M and K-8 acceptable for individual branch circuit runs.

G. Metal Surface Raceway

1. Wiremold #500/700 metallic series or equivalent, unless otherwise indicated on Drawings.
2. Provide associated fittings as required.
3. Standard color as selected by the Architect.

H. Wireway

1. NRTL 870 listing throughout, including connectors and fittings.
2. Hinged cover construction.
3. Sealing capability where required.
4. Suitable for "lay-in" installation of conductors.
5. Rust inhibiting phosphatizing undercoat and baked enamel finish.
6. Plated hardware.
7. Square D "Square Duct", or equivalent.

I. Expansion Fittings

1. Metallic: OZ, Thomas and Betts Company, or equivalent.
2. Non-Metallic: Carlon, or equivalent.

J. Firestop Assemblies

1. Firestop systems shall consist of fittings and/or intumescent materials assembled as per UL (or other NRTL) System Details.
2. Product manufacturers: 3M, Chase Technology Corporation, Dow Corning Fire Stop, Hilti, International Protective Coatings Corp. (Flame Safe), or Nelson Fire Stop Systems.

K. Thru Wall and Floor Seals

1. OZ-Gedney Type "FSK", or equivalent.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General

1. Electrically continuous throughout.

2. Plumb and level.
3. Cut square and reamed smooth.
4. Use commercial bender for offsets and bends.
5. Cap to prevent debris from entering during construction.
6. Swab conduit prior to installation of conductor.
7. Provide pull cord in empty conduits.
8. Alter conduit routing to avoid structural obstructions, minimizing crossovers.
9. It is the intent of this Specification to provide reasonable provisions for future expansion of electrical use (See NEC 90.8 and 90.1(B), FPN). Therefore, **install all branch circuit home runs as shown on Drawings. Do not combine home runs or increase quantity of conductors therein.**
10. Install raceway, conduit and fittings in accordance with Code, NRTL listing and manufacturer's recommendations.

B. Concealed Interior Raceway

1. Conceal all raceway within building construction.
2. May be run in a direct line for Contractor's convenience.
3. For Contractor's convenience, **concealed** stubs from concrete-encased PVC conduit runs may extend to first **concealed** junction box.
4. Where applicable, center within insulation any electrical conduit routed in attic space. Provide sealing as per NEC 300.7(A) for all conduits exposed to different temperatures.

C. Exposed Interior Raceway

1. Use limited to mechanical and electrical equipment rooms, motor connections, and panelboards scheduled as surface.
2. Shall not be used in finished area.
3. Run parallel or perpendicular to building lines.
4. **Provide RGSC or EMT stubs for concrete-encased PVC conduit runs.** Extend stub from RGSC coupling set flush in floor.
5. Provide flexible conduit as required for motor and equipment connections.

D. Concrete Encased Raceway

1. Shall not interfere with structural integrity of slab, column, or beam.
2. Installation subject to acceptance of Structural Engineer.
3. Maximum diameter 1/3 thickness of concrete member.
4. Install in center of section.
5. Provide expansion fitting when crossing building expansion joint. Grounding integrity of raceway to be maintained.

E. Exterior Raceway

1. Minimum 24" below grade.
2. PVC unless otherwise indicated.
3. **Exterior surface stubs for PVC conduit runs: RGSC, including final underground sweep.** Exterior surface stubs acceptable only where specifically shown.

4. Penetrating Watertight Walls or Floors: Provide block-out with 1/2" clearance around conduit for underground penetrations. Pack with Oakum and caulk with non-shrinking grout or provide conduit entrance seal.
5. Penetrating Roof or Waterproofing Membranes: Provide flashing and pitch pocket.
6. Contractor responsible for providing a watertight penetration.
7. Coat RGSC penetrations with heavy asphaltic-base compound.
8. Unless otherwise indicated, route exterior conduits to interior distribution equipment concealed under slab.

F. Supports

1. Refer to NEC 300.11
2. **Tie wire supports not acceptable.**
3. Support Spacing: NEC.

G. Specific Locations

1. Allow 6" minimum clearance at flues, steam pipes and heat sources.
2. Conduit visible behind grills and registers: paint black.
3. Seal conduit where leaving heated area and entering unheated area.
4. Penetrating non-watertight walls or floors: Pack space between conduit and block-out on both sides with Oakum.
5. Penetrating fire rated walls or floors: Seal to prevent passage of fire or products of combustion.
6. From each flush mounted panel location, stub three additional 3/4" conduits into nearest accessible ceiling space.
7. Do not mount raceway on ductwork, cover access doors, panels, controls, or otherwise hinder normal maintenance and repair of the equipment.
8. Motors:
 - a. Connect to motor feeder or branch circuit by means of flexible metal conduit or liquidtight flexible metal conduit in moist areas.
 - b. Minimum flexible length: 18".
 - c. Where practical, feed floor mounted motors from raceway installed in or under slab.
 - d. When floor mounted motors are fed overhead, provide required support for raceway. Extend raceway to floor and provide a floor flange. Insert "T" conduit fitting at proper height and extend flexible conduit to motor.

3.2 SIZE

A. National Electrical Code, subject to stated minimums.

B. Minimum Size

1. Exterior raceway: 3/4".
2. In or under poured concrete (including precast concrete panels): 3/4".
3. Branch circuit home run: 3/4". Consider home run to include raceway length from panelboard, switchboard, or motor control center to nearest power consuming or switching device on that circuit.
4. Feeders: 3/4".

5. All others not listed: 1/2".

3.3 TYPE

A. Intermediate Metal Conduit (IMC)

1. May be used in place of rigid galvanized steel conduit for Contractor's convenience.
2. Comply with manufacturer's recommendations for bending, threading and cutting operations.
3. Install as specified for rigid galvanized steel conduit.

B. Rigid Galvanized Steel Conduit (RGSC)

1. Use:
 - a. Overhead electric and telephone service entrance. IMC or Aluminum not acceptable for this application.
 - b. All raceway exposed to weather. Aluminum not acceptable for this application.
 - c. Where required by national, state and local codes.
2. Fittings: Threaded except at KO type boxes where double locknut/bushing method acceptable.
3. Waterproof entire length with heavy asphaltic base compound when:
 - a. Embedded directly in earth.
 - b. Embedded in concrete directly in contact with earth, with or without vapor barrier.
 - c. Penetrations run directly from concrete with earth, to soil burial.
4. Factory applied PVC coating acceptable in place of asphaltic base compound.

C. Rigid Non-Metallic Conduit (PVC)

1. Use only in slabs and exterior underground locations. See 3.1 B3, C4 and E3 for limitations.
2. Provide insulating bushing at all terminal adapters.
3. Provide equipment grounding conductor within raceway.
4. Increase trade size accordingly for equipment grounding conductor.
5. Utilize commercial heating element type bending equipment. **Do not use torches to bend PVC conduit.**

D. Electrical Metallic Tubing (EMT)

1. Use in all areas not prohibited by NEC and this Specification.
2. Do not use in concrete slabs on or under grade, or walls under grade.
3. Do not use in exterior underground applications.

E. Flexible Metal Conduit

1. Use for connections to transformers, motors, fixed appliances, recessed luminaires and other equipment as required.
2. Use liquidtight conduit with liquidtight fittings in areas of high moisture content.

F. Metal Surface Raceway

1. Install complete with matching boxes, fittings, and end caps, parallel or perpendicular to building construction.
2. Wire adjacent devices to alternate circuits where metal surface raceway contains devices integral to the channel.
3. Feed from flush connector in wall directly into raceway. Field cut base as required with 1/2" knockout for this purpose. Do not utilize Wiremold catalog #2051H for #2000/2100 series.

G. Fire Resistive Walls and Decks

1. Preserve integrity of fire rating through the use of UL (or other NRTL) Listed firestop assemblies of appropriate penetration type and rating time.
2. Install in accordance with manufacturer's recommendations.
3. All floor to floor penetrations and all wall penetrations into Mechanical, Electrical, and Communications Rooms shall be sealed with 1 hour firestop assemblies unless more stringent rating is required by building codes.
4. Include UL (or other NRTL) firestop assembly sheets and manufacturer product data sheets specifically used with the Project Closeout Documentation.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide all outlet, pull and junction boxes complete with associated covers and rings.

B. Work Installed But Furnished Under Other Directives.

1. Obtain manufacturer's backboxes or recommendations for special equipment.

1.2 SUBMITTALS

A. Record Drawings

1. Maintain accurate record drawings in accordance with Section 260500.

PART 2 – PRODUCTS

2.1 CEILING BOXES

A. Flush and Surface

1. 2-1/8" minimum depth.
2. Square or octagon as required.
3. Galvanized steel.
4. Manufacturer: Appleton, Raco, Steel City or equivalent.

2.2 WALL BOXES

A. Flush

1. One and two gang wall boxes: 4" square box, 2-1/8" minimum depth with appropriate plaster or tile ring.
2. More than three gang: Gangable 3-1/2" deep unless wall cavity limits depth to 2-1/2".
3. Use 4-11/16" square boxes where required by Code.
4. Single gang masonry boxes acceptable only for single conduit entrance. Feed-through circuiting not acceptable. Use 4" square box/tile ring for feed-through applications.

B. Surface Mounted Devices

1. 4" square box, 2-1/8" minimum depth with appropriate 1/2" raised cover.
2. Manufacturer: Appleton, B-Line, Raco, Steel City, Wiegmann, or equivalent.

C. **Sectional, through wall and handy boxes not acceptable.**

2.3 PULL AND JUNCTION BOXES

- A. Galvanized steel with cover.
- B. Size: National Electrical Code.
- C. Manufacturer: Appleton, Raco, Hoffman, Shallbetter, Steel City, Wadsworth or equivalent.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General

- 1. Install in accordance with code, product listing and manufacturer's recommendations.
- 2. Install boxes plumb, level and flush with finish surface.
- 3. Support securely and rigidly.
- 4. Verify wall depths to ensure adequate clearance for special backboxes.
- 5. Provide barriers in ganged switch outlets where voltage between adjacent switches exceeds 300 volts.

B. Location

- 1. Governed by structural conditions and obstructions.
- 2. Mount switch outlet on strike side of door, maximum 4" from door opening to first switch. Verify door swing with Architectural Plan.
- 3. Coordinate equipment outlets prior to installation for proper concealment.
- 4. Center outlets with respect to acoustical tile, paneling and furring trim.
- 5. Adjust outlets in masonry or tile construction to horizontal and vertical mortar joints.
- 6. Clear all piping, ductwork and other obstructions.
- 7. For outlet boxes on opposite sides of walls or partitions with separation distances of 24" or less, pack all interconnecting conduits with Duxseal after conductor installation, to prevent sound transmission.
- 8. Outlet boxes improperly located shall be corrected at Contractor's expense.

C. Mounting Heights

- 1. All device mounting heights shall conform to ADA Recommendations. Refer to Standard Electrical Symbol Legend for nominal mounting heights.
- 2. Verify height of all outlets to ensure installation above top of radiation covers, mirrors, counters and any other obstructions that may alter nominal mounting height.
- 3. **Measure from finish floor to centerline of outlet.**
- 4. Mount exterior outlets horizontally. Measure height from nearest interior finish floor below outlet.
- 5. Mount outlet designated AC (above counter) no less than 4" higher than top of countertop backsplash.

D. Fire Resistive Walls and Ceilings

1. Penetrations for steel electrical outlet boxes permitted, provided:
 - a. Boxes do not exceed 16 square inches in area.
 - b. Area of such openings to not exceed 100 square inches for any 100 square feet of area.
 - c. Outlet boxes on opposite sides of walls or partitions separated by horizontal distance of 24 inches.

E. Pull and Junction Boxes

1. Pull and junction boxes are generally not indicated on Drawings.
2. Install in accordance with National Electrical Code and as required to facilitate wire pulling.
3. Do not install in finished spaces without approval of Engineer.

F. Identification

1. Identify pull and junction boxes containing system voltages in excess of 250 volts to ground with voltage markers.
2. Voltage markers: Not visible in finished areas.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Label electrical equipment as required by Codes and Specifications and as specifically directed by Engineer.

PART 2 – PRODUCTS

2.1 PANEL DIRECTORIES

- #### **A. Include directory cards with panelboards.**

2.2 NAMEPLATES

- #### **A. Machine-engraved black laminate with white core, except as otherwise indicated.**
- #### **B. Minimum letter size: 1/8".**
- #### **C. Minimum plate size: 1" X 3".**

2.3 VOLTAGE MARKERS

- #### **A. Vinyl impregnated cloth markers with legend as required.**
- #### **B. Manufacturer: Ideal #44-360, or equivalent.**

2.4 PRESSURE SENSITIVE TAPE

- #### **A. Use only when specifically referred to in other Sections.**
- #### **B. Manufacturer: Dymo, or equivalent.**

2.5 UNGROUNDED CONDUCTOR IDENTIFICATION

- #### **A. As per NEC 210.5(C) and 215.12(C).**
- #### **B. Typewritten cards behind plastic shield, affixed with double-stick carpet tape. Heat surface prior to affixing directory.**

PART 3 – EXECUTION

3.1 GENERAL

A. Directory Cards

1. **Typewritten only.** Hand lettering unacceptable, except at "spares" and "spaces", where neat hand lettering with erasable pencil is required.
2. Indicate type of load and rooms where load occurs.
3. **Do not use room numbers as shown on Drawings but refer to name and numbers on door.**
4. Do not identify until final load balancing is accomplished.

B. Nameplates

1. Apply plumb and level with two counter-sunk screws.
2. Glue, double-stick tape, or similar adhesive not acceptable.

C. Device Plates

1. Machine-engrave directly on plate in lieu of separate nameplate.
2. Fill inscriptions with contrasting color.

D. Voltage Markers

1. Not visible in finished areas.

E. Pull and Junction Boxes

1. Mark all covers with indelible marker to indicate panelboard designation and circuit numbers for circuits contained within box.

3.2 EMERGENCY SYSTEM COMPONENTS

- A. All boxes and enclosures (including transfer switches, generators and power panels) for emergency circuits shall be permanently marked so they will be identified as a component of an emergency circuit for system.

3.3 SERVICE EQUIPMENT FAULT CURRENT NAMEPLATE

- A. Provide warning nameplate on each service disconnecting means enclosure indicating the fault current of the system.
- B. Fault current shall be calculated at the utility transformer, using an assumed infinite primary bus, and using the actual transformer impedance and kVA values.
- C. Red laminate with white core.
- D. Letter height: minimum 1/4".

E. Inscription:

SERVICE AVAILABLE FAULT CURRENT: _____
TRANSFORMER KVA: _____
TRANSFORMER IMPEDANCE: _____
DATE: _____

3.4 "WILD LEG" WARNING NAMEPLATE (240V 3Ø 4W SYSTEMS)

- A. Provide a warning nameplate on all fusible switches, panelboards and switchboards where a grounded (identified) conductor is present.
- B. Red laminate with white core.
- C. Letter height: minimum 1/4".
- D. Inscription:

CAUTION "B" PHASE HAS 208 VOLTS TO GROUND
240V 3Ø 4W DELTA SYSTEM

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide wiring devices complete with device plates of matching or specified color. Wiring devices include receptacles for the connection of portable equipment and switches used for the control of both lighting and fractional horsepower motor loads. Also included are dimmers, occupancy sensors, photoelectric switches and time switches.

B. Work Installed But Furnished by Others

1. Where indicated, install devices furnished by other Divisions of this Specification.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit information in accordance with Section 260500.

B. Record Manuals

1. Provide information in accordance with Section 260500.
2. Include installation and maintenance instructions accompanying the equipment.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Device color: Gray or as selected by Architect. Verify with Architect. (Exception: Red devices on emergency circuits where applicable).
- B. All devices shall be of the same manufacturer, except where specifically noted otherwise with the phrase "NO SUBSTITUTION".

2.2 SWITCHES

A. AC Toggle and Keyed Switches

1. 20-ampere 120/277 volt AC and HP rated.
2. Industrial Grade.
3. Color coded face or body by amperage.
4. Screw pressure plate back wire and side wire.
5. Federal Spec WS-896 listed.

6. Acceptable Manufacturers:
 - a. Cooper 2220 series
 - b. Hubbell 1220 series
 - c. Leviton 1220 series
 - d. Pass & Seymour PS20AC series

B. Pilot Light Switches

1. Neon lamp in red toggle handle, lit in "on" position.
2. 20 ampere, 120/277 volt AC rated.
3. Manufacturer: As listed above.

2.3 RECEPTACLES

A. General Purpose

1. 20 ampere, self-grounding, NEMA 5-20R, industrial specification grade.
2. Nylon face with finder grooves and compact body.
3. Minimum 0.032" triple wipe brass contacts.
4. Corrosion resistant steel strap interlocked with face and body.
5. Screw pressure plate back wire and side wire.
6. Federal Spec WC-596 listed.
7. Acceptable Manufacturers:
 - a. Cooper 5362
 - b. Hubbell 5362
 - c. Leviton 5362
 - d. Pass & Seymour CRB5362

B. GFCI

1. 20 ampere, feed-through type.
2. Two utilization points per device, with vertical orientation.
3. Manufacturer: As listed above.
4. Manufacturer: As listed above.

C. Damp & Wet Locations

1. All 15 and 20 ampere, 125 and 250 volt non-locking receptacles shall be listed weather-resistant type as per NEC 406.9(A) and 406.9(B)(1).
2. Manufacturer: As listed above.

2.4 DEVICE PLATES

A. Flush Interior

1. Opening for device intended.
2. 430 or 302/304 stainless steel, or as selected by Architect.
3. Where plastic plates are selected by Architect, provide thermoplastic type.

4. Manufacturer: Cooper, Hubbell, Leviton and Pass & Seymour.
- B. Surface Interior
1. 1/2" raised cover
- C. Damp & Wet Locations
1. Damp locations:
 - a. Refer to NEC 406.9(A).
 - b. Die-cast aluminum construction with stainless steel springs.
 - c. Unless indicated otherwise on the Drawings, Manufacturer: Pass & Seymour #4500 series or equivalent.
 2. Wet locations:
 - a. Refer to NEC 406.9(B).
 - b. Unless indicated otherwise on the Drawings, Manufacturer: Red Dot #CKMU (horizontal) or #CKMUV (vertical), or approved equal by Hubbell.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General
1. Install device and plates where shown on Drawings in accordance with Code, product listing and manufacturer's recommendations.
 2. Refer to Section 260534-3.1C for mounting heights.
 3. Plumb and level.
 4. Tight to wall.
 5. Thoroughly cover wall opening around device.
 6. Replace all devices and plates that become discolored or burned during construction.
 7. Provide blank plates for unused openings.
 8. Connect wiring devices by means of single conductor tails. Multiple wire connections not acceptable.
 9. Tighten unused connection screws.
- B. Identification
1. Identify wall switches which control lighting or equipment not in sight.
 2. Refer to Section 260553-3.1C.
- C. Receptacles
1. Vertical mounting with grounding pole at bottom.
 2. Provide GFCI receptacles at NEC 210.8 locations.

3.2 TESTS

- A. Proper operation of lighting switches, dimmers and occupancy sensors.

B. Duplex Receptacles

1. Proper connections.
2. Test all receptacles with NRTL listed receptacle circuit tester similar to Bryant #5266-PT, or Ideal #EZ Check.

3.3 INSTRUCTIONS

- A. Instruct Owner's personnel in proper operation, setting, and maintenance of time switches, dimmers, occupancy sensors, and GFCI receptacles.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide all fuses as required.

B. Work Furnished But Not Installed

1. Provide spare fuses for all sizes and classes required.
2. Quantity: 10%, with a minimum of three each rating, including motor starter control transformer fusing.

1.2 SUBMITTALS

A. Record Drawings

1. Indicate actual class, type and size of fuse installed in each device.

B. Record Manuals

1. Submit information in accordance with Section 260500.

PART 2 – PRODUCTS

2.1 FUSES

A. Larger than 600 amperes.

1. UL-listed, Class L.
2. Manufacturer: Bussmann Limitron KLU or "Hi-Cap" KRP-C, Littelfuse KLP-C, or Brush LCL.

B. 600 Amperes and Less Protecting Feeders or Combination Motor/Branch Circuit Loads

1. UL-listed, Class RK-1.
2. Manufacturer: Bussmann LPN-RK/LPS-RK, Littelfuse LLN-RK/LLS-RK, or Brush LEN-R/LES-R.

C. Motor Starter Control Transformers

1. As recommended by manufacturer.

D. Plug Fuses

1. Dual element, UL-listed Type S with adapter.
2. Use only as indicated on Drawings for fused toggle switches.

2.2 SPARE FUSE CABINET

A. Construction

1. Welded steel or .080 gauge aluminum.
2. Gray enamel finish.
3. Locking handle/cylinder lock.
4. Integral shelving.

B. Size: Minimum 30" H x 24" W X 12" D.

C. Acceptable Manufacturers: American Midwest Power SFC 36, B-Line 243012FC, Busmann SFC, Gould Shawmut GSFC, or Littelfuse LSFC.

2.3 PLYWOOD BACKING

A. 3/4" grade AD, fire resistant, painted gray (including edges).

PART 3 – EXECUTION

3.1 STORAGE

A. Store fuses in a cool, dry space prior to installation.

3.2 INSTALLATION

A. General

1. Install fuses in accordance with Code, product listing and manufacturer's recommendations.
2. Verify equipment fuse sized for load prior to installation.
3. All fuses shall be of same manufacturer.
4. Do not mix fuse classes in individual applications.
5. Fuses are not required for switchboard devices marked "Spare".

B. Spare Fuse Cabinet

1. Top of trim 6'-3" above finished floor.
2. Provide 3/4" plywood backing.

C. Identification

1. Indicate on inside cover with pressure sensitive tape the size, voltage and type of fuse furnished for each device.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide disconnect switches where shown on Drawings or required by Code.
2. Provide enclosed circuit breakers where shown on the Drawings.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit information in accordance with Section 260500.
2. Indicate on submittal exact motor or equipment served.
3. Show all details including electrical ratings, enclosure dimensions and other pertinent data.

B. Record Manuals

1. Submit information in accordance with Section 260500.
2. Include installation and maintenance instructions accompanying the equipment.

PART 2 – PRODUCTS

2.1 DISCONNECT SWITCHES

A. Switch Interior

1. Positive “off” position.
2. Lugs: NRTL-listed for aluminum and copper cable.
3. Plated current carrying parts.

B. Switch Mechanism

1. Quick-make, quick-break operating handle and mechanism.
2. Integral part of box.
3. Enclosures: Code gauge sheet steel (NEMA 1) or Code gauge galvanized steel (NEMA 3R).
4. Treat with rust-inhibiting phosphate primer.
5. Finish: Baked enamel.

C. Ratings

1. 250 or 600 volt.
2. Heavy duty.
3. Horsepower rated.
4. NRTL-listed "Suitable for Use as Service Equipment" when required.

- D. Fusing
 - 1. NRTL-listed rejection feature.
 - 2. Reject all fuses except UL-listed Class R.
- E. Manufacturer: Panelboard manufacturer.

2.2 ENCLOSED CIRCUIT BREAKERS

- A. Breaker Types:
 - 1. Under 400 ampere: Quick-make, quick-break, thermal magnetic unless otherwise indicated.
 - 2. 400 ampere and over: Solid-state molded case circuit breakers:
 - a. Breakers shall contain electronic sensing, timing and tripping circuits.
 - 1) Long-time current
 - a) Adjustable current pickup.
 - b) Adjustable time delay.
 - 2) Short time current
 - a) Adjustable current pickup.
 - b) Adjustable time delay.
 - 3) Instantaneous current
 - a) Adjustable current pickup
 - 4) Ground fault, where required, with integral test and reset buttons.
 - a) Adjustable current pickup.
 - b) Adjustable time delay.
 - b. Where used as a main service disconnect, or main branch panel device, provide maintenance-mode override.
 - 3. Trip indicating.
 - 4. Minimum SCCR rating:
 - a. 10,000 for systems up to 240 volts.
 - b. 35,000 for 277/480 volt systems.
- B. Manufacturer: Panelboard manufacturer.

2.3 PLYWOOD BACKING FOR SURFACE MOUNTED SWITCHES

- A. For interior locations, mount on 3/4" AD, fire-resistant, painted gray (including edges).

PART 3 – EXECUTION

3.1 STORAGE

- A. Store disconnect switches or enclosed circuit breakers in a cool, dry space prior to installation.

3.2 INSTALLATION

A. General

1. Install all required disconnect switches or enclosed circuit breakers in accordance with Code, product listing and manufacturer's recommendations.
2. Plumb and level.
3. Tighten lugs in accordance with manufacturer's recommendations.

B. Identification

1. Identify disconnect switches or enclosed circuit breakers in accordance with Section 260553.
2. Nameplate required for all disconnect switches. Nameplate to include load served, voltage, horsepower or MCA rating, and fuse size. Nameplate shall be installed inside of cover on exterior disconnect switches.

Example:

RT-1
480 Volt, 3 Ø
35 MCA, 40 A Fuses

3. Do not use schedule number, but indicate load served.
4. Pressure sensitive tape identification for disconnect switches containing fuses.
5. Voltage markers on all disconnect switches containing system voltages in excess of 250 volts to ground.

3.3 TESTING

A. GFPE Testing

1. Performed when first installed on site, prior to being energized by utility transformer.
2. Primary current injection method shall be used for testing purposes per NEC 230.95-C.
3. Conducted in accordance with manufacturer's instructions.
4. Conducted in presence of manufacturer's representative.
5. Provide letter of verification to Engineer indicating:
 - a. Date of test.
 - b. Name of manufacturer's representative present.

3.4 CLEANING

- A. **Clean and vacuum interior** to remove all wire and insulation scraps, dust and dirt.
- B. Clean all exposed surfaces immediately prior to final inspection.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide motor starters where shown and scheduled, or as required by Code.

B. Work Installed But Furnished Under Other Directives

1. Refer to Section 260500, Article 1.1, Paragraph D for extent of control devices furnished in other Divisions.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit information in accordance with Section 260500.
2. Show all details including electrical ratings, controls, schematic wiring diagrams, enclosure dimensions and other pertinent data.
3. Indicate on submittal exact motor or equipment served.

B. Record Manuals

1. Submit information in accordance with Section 260500.
2. Include installation and maintenance instructions accompanying the equipment.

PART 2 – PRODUCTS

2.1 GENERAL

A. Product of same manufacturer.

B. Sizing based upon Eaton equipment.

C. Other acceptable manufacturers: Approved equal units by Allen Bradley, Schneider, and Siemens.

D. Contractor is cautioned to verify all physical dimensions of "equal" units prior to accepting quotation for Bid.

2.2 SINGLE PHASE MOTORS WITH INTEGRAL OVERLOAD PROTECTION

A. Horsepower rated toggle switch, pilot handle where not in sight from motor.

2.3 SINGLE PHASE MOTORS WITHOUT INTEGRAL OVERLOAD PROTECTION

A. Manual Motor Starter

1. Manually operated toggle switch with integral overload protection.
2. Rendered inoperative unless thermal unit is in position.
3. Provide pilot light for manual starters not in sight from motor.
4. Provide flush-mounted starters with stainless steel plates.
5. NEMA 1 enclosures for surface-mounted starters unless otherwise required by environment.

B. Fused Toggle Switch

1. 4" square box mounting.
2. Complete with fuse adapter and plug fuse of correct rating.
3. Manufacturer: Bussmann or Reliance.
4. **Use only where specifically shown.**

2.4 THREE PHASE AND SPECIFIED SINGLE PHASE MOTORS

A. Across-the-line

1. Magnetic type, non-reversing unless otherwise scheduled.
2. Rated in accordance with NEMA standards, sizes and horsepower ratings.
3. Provide combination fusible unit with Class R fuse holders, where disconnect and starter are shown at the same location.
4. Minimum size: NEMA size 0.
5. Manufacturer's series: Eaton Freedom series, or approved equal units by Allen Bradley 512 series, Schneider 8538 series or Siemens Class 17 series.
6. Control
 - a. 120 volt control transformer
 - b. Control fusing:
 - 1) 250 volt - in accordance with NEC.
 - 2) 600 volt - primary and secondary fusing regardless of VA rating of control transformer.
 - c. Cover-mounted devices for single-speed starters:
 - 1) Transformer operated LED green pilot light for running indication, with push-to-test feature.
 - 2) H-O-A selector switch, unless otherwise scheduled.
 - d. Cover-mounted devices for two-speed starters:
 - 1) Transformer operated LED pilot lights for running indication, with push-to-test feature: Green for low speed, amber for high speed).
 - 2) High-low-off-auto selector switch, unless otherwise scheduled.
 - e. Molded coil construction.
7. Overload Protection – exterior locations
 - a. Resettable overload protection on all phases.

- b. Class 20 construction.
 - c. Starter inoperative if one or more overload units removed.
 - 8. Overload Protection – interior locations
 - a. Self-powered.
 - b. Solid state construction with adjustable overload protection on all phases.
 - c. Manual reset with capability for remote reset function.
 - d. Phase loss protection.
 - e. Ambient-insensitive within operating range of -25°C to 55°C.
 - f. Solid state construction, Class 20.
 - g. Starter inoperative if overload unit is removed.
 - 9. Electrical Interlocks
 - a. Space for minimum three, any arrangement NO or NC.
 - b. Quantity: Two NO per starter.
- B. Solid State Starters
- 1. Control and interlock options as previously indicated.
 - 2. Run bypass contactor.
 - 3. Class 20 overload protection.
 - 4. Heavy-duty rating.
 - 5. Temperature: NRTL-listed for -30 to 50°C ambient.
 - 6. Rated for 4 starts per hour
 - 7. Adjustable ramp times, torque control, and kick start.
 - 8. Solid state reduced voltage type: Eaton 801+ Series.
 - 9. Other acceptable manufacturers: As previously indicated.

2.5 THREE PHASE POWER MONITOR

- A. Provide for all three phase motors larger than two horsepower, and all three phase compressor equipment.
 - 1. Not required for motors served by solid state starters or variable frequency drives.
- B. Line voltage to match system.
- C. Operating parameters:
 - 1. Trip: 90% rated voltage on any or all phases.
 - 2. Reset: 93% rated voltage on all three phases.
 - 3. Dead band between trip and reset: 3%.
 - 4. Repeat accuracy: 1% maximum at 0-70°C.
 - 5. Trip Delay Time: Two seconds.
 - 6. Reset: Two seconds.
 - 7. Output contact rating: Pilot Duty, 470 VA @ 600 VAC.
 - 8. Transient Protection: 2500 Volts for 10 MS.

D. Special Options

1. NEMA 1 or 3R enclosure as required.
2. Adjustable Time Delayed Restart: 30-300 seconds. Set at 300 seconds.

E. Manufacturer: Motor Saver Model 350.

F. Other acceptable manufacturers: Eaton #D65 series.

2.6 NOT USED

2.7 PLYWOOD BACKING FOR SURFACE MOUNTED STARTERS

A. 3/4" grade AD, fire-resistant, painted gray (including edges).

PART 3 – EXECUTION

3.1 STORAGE

A. Store motor starters in cool, dry space prior to installation.

3.2 INSTALLATION

A. General

1. Plumb and level.
2. Install motor starters in accordance with Code, product listing and manufacturer's recommendations.
3. Tighten all lugs in accordance with manufacturer's recommendations.
4. Verify correct size overload protection with motor nameplate data and manufacturer's recommendations.
5. Where power factor correction is specified for connection to motor terminals (i.e. load side of overload units), reduce overload rating as per manufacturer's recommendations.
6. Provide 3/4" plywood backing where several controls are shown grouped for surface mounting.

B. Identification

1. Identify motor starters in accordance with Section 260553.
2. Provide two nameplates for all motor starters: One for starter, other for equipment. Do not mount equipment nameplate on motor. Rather, mount on equipment, in visible location near motor.
3. Do not use motor schedule numbers, but indicate motor or load served.
4. Provide pressure-sensitive tape identification in accordance with Section 260553 and 262813 for all motor starters containing fuses.
5. Indicate proper thermal overload unit by circling correct number on chart affixed to cover of starter.
6. Provide voltage markers for all motor starters containing a system voltage in excess of 250 volts to ground.

7. Voltage markers not required for motor starters which form a part of a motor control center as specified in Section 262419.

3.3 TESTS

- A. Proper operation.
- B. Correct rotation.
- C. Solid state motor starters
 1. Furnish letter of verification to Engineer indicating solid state motor starters have been tested by manufacturer's representative.
 2. List date of test and name of manufacturer's representative.

3.4 INSTRUCTIONS

- A. Manufacturer's representative shall instruct Owner in proper maintenance and testing of solid state motor starters. Include name of Owner's representative in letter of verification.
- B. Record instructions and include with Record Manuals in accordance with Section 260500.

3.5 CLEANING

- A. **Clean and vacuum interior** to remove all wire and insulation scraps, dust and dirt.
- B. Clean all exposed surfaces immediately prior to final inspection.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide integral Surge Protective Device in panelboards and switchboards where indicated and scheduled.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit information in accordance with Section 260500.

B. Record Manuals

1. Submit information in accordance with Section 260500.
2. Include installation and maintenance instructions accompanying equipment.

PART 2 – PRODUCTS

2.1 TYPE 2 SURGE PROTECTIVE DEVICE (SPD)

A. Provided only in panelboards and switchboards as indicated on the drawings.

B. The panelboard/switchboard manufacturer shall internally install SPD protection within the panelboard and the entire assembly shall be UL 67 listed.

C. SPD requirements:

1. Listed and component recognized in accordance with latest editions of UL 1449, UL 96A and UL 1283.
2. Minimum surge capacity ratings as indicated on the drawings. Operating voltage and configuration as indicated on the drawings
3. 200kA Short Circuit Current Rating (SCCR). SPD devices obtaining SCCRs using upstream over current protection are prohibited.
4. 20kA nominal discharge current.
5. EMI/RFI noise filtering attenuation up to 50dB for 10kHz – 100MHz.
6. Self contained module design, with each suppression element metal-oxide varistor (MOV) based incorporating thermal protection. End of life mode shall be open circuit.
7. Surge current diversion paths between each phase conductor and the neutral conductor, between each phase conductor and the ground and between the neutral conductor and ground. For delta configured systems, the SPD shall have components connected between each phase conductor and between each phase conductor and ground.

8. UL 1449 latest edition listed and recognized component voltage protection rating (VPR) shall not exceed:

<u>VOLTAGE</u>	<u>L-N</u>	<u>L-G</u>	<u>N-G</u>	<u>L-L</u>
240/120 1Ø	700V	700V	700V	1200V
208Y/120	700V	700V	700V	1200V
240D/120	700/1200V	700/1200V	700V	1800V
480Y/277	1200V	1200V	1200V	2000V

9. Designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.
10. Equipped with on board visual and audible diagnostic monitoring devices mounted on the front cover of the SPD.
- Indicating lights shall provide full time visual diagnostic monitoring of the operational status of each phase of the surge current diversion module.
 - Audible diagnostic monitoring shall be by way of audible alarm. This alarm shall activate upon a fault condition. An alarm on/off switch shall be provided to silence the alarm.
 - LCD display surge counter located on the front cover of the SPD. Counter shall be equipped with a manual reset with protection from accidental operation and utilize non-volatile memory.
 - A set of Form "C" dry contacts shall be provided for remote annunciation.
11. Warranty: The panelboard manufacturer shall warranty the SPD for full replacement if destroyed by transients, including lightning, for a period of ten (10) years.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. SPD protection modules shall be factory installed by the panelboard/switchboard manufacturer integral to the panelboards/switchboards indicated on the drawings. Each entire assembly shall be UL 67 listed.

3.2 TESTS

- A. Verify all SPD equipment is active and in proper working condition prior to final project inspection.

3.3 CLEANING

- A. **Clean and vacuum interior** to remove all wire and insulation scraps, dust and dirt.
- B. Clean all exposed surfaces immediately prior to final inspection.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. The Contractor shall provide operational electrical connections to all electrically driven or controlled equipment.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General

1. The Contractor shall provide all necessary materials and labor required to make final operational connections to all equipment, generally as shown on the Drawings, and specifically as required by equipment specifications and installation literature.
2. Control devices and panels furnished by others will be delivered to the contractor at the jobsite and shall be installed in accordance with manufacturer's printed instructions. Review equipment specifications to determine extent of work involved.

PART 3 – EXECUTION

3.1 GENERAL

- A. Provide operational connections for all equipment shown on the Drawings. Connections shall be in accordance with manufacturer's recommendations and shall be left operating in a manner acceptable to the Engineer and Owner.
- B. Provide available fault current calculations for equipment listed in Section 260500-1.4E based on actual installation criteria (conductor lengths, raceway types, etc.). Calculations shall incorporate the current limiting effects of fuses supplied with local disconnecting means. Include calculation information in Record Manuals.
- C. For all exterior mechanical equipment, provide weatherproof GFCI receptacle outlet within 25' of equipment, circuited to nearest unswitched power. Refer to NEC 210.63 and 406.8.
- D. For all mechanical equipment located in attic and crawl spaces, provide porcelain lamp holder with integral receptacle and lamp guard, circuited to nearest unswitched power via pilot handle toggle switch near access hatch. Engrave plate. Refer to NEC 210.70(C).

3.2 CLEANING

- A. **Clean and vacuum interior** to remove all wire and insulation scraps, dust and dirt.
- B. Clean all exposed surfaces immediately prior to final inspection.

END OF SECTION