ASSOCIATED
CONSULTING
ENGINEERING
INCORPORATED

PROJECT MANUAL FOR

JUVENILE DETENTION CENTER BOILER REPLACEMENT
Sioux Falls, SD

ACEI Project No.: 117054

June 19, 2017

340 South Phillips Avenue
Sioux Falls, South Dakota 57104-6910
T: 605.335.3720
F: 605.335.6220
E-mail: acei@aceinet.com

PROJECT MANUAL

JUVENILE DETECTION CENTER
BOILER REPLACEMENT
SIOUX FALLS, SOUTH DAKOTA

June 19, 2017
Associated Consulting Engineering, Inc.
Project No.: 117054

OWNER:
Minnehaha County
Mark Kriens
500 N. Minnesota Ave
Sioux Falls, South Dakota 57104
(605) 367-4241

PROJECT LOCATION:
4200 S West Ave.
Sioux Falls, SD 57105

MECHANICAL ENGINEER:
Associated Consulting Engineering, Inc.
Ryan Van Der Bill, P.E.
340 South Phillips Avenue
Sioux Falls, SD 57104-6910
Phone: (605) 335-3720
Fax: (605) 334-6220
email: rvanderbill@aceinet.com

ELECTRICAL ENGINEER:
Associated Consulting Engineering, Inc.
Brad Shoup, P.E.
340 South Phillips Avenue
Sioux Falls, SD 57104-6910
Phone: (605) 335-3720
Fax: (605) 334-6220
email: bshoup@aceinet.com

Juvenile Detention Center

Boiler Replacement

in the City of

Sioux Falls, South Dakota

Prepared by: Associated Consulting Engineering, Inc.
340 S. Phillips Avenue
Sioux Falls, SD 57104
(605) 335-3720

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Notice to Bidders

JUVENILE DETENTION CENTER BOILER
REPLACEMENT

Minnehaha County will be accepting sealed bids for the Juvenile Detention Center Boiler Replacement. Specifications and other documents may be obtained at several local builder's exchanges and at Associated Consulting Engineering, Inc. 340 S. Phillips Ave., Sioux Falls, SD. 57104. Phone 605-335-3720. Email smogen@aceinet.com

Sealed bids will be received at the Auditor's office, 415 N. Dakota Ave., Sioux Falls, SD 57104, until 10:15 a.m. on July 12, 2017. Bids will be publicly opened and read at 10:30 a.m.

Bids must be accompanied by a Cashier's Check payable to Minnehaha County in an amount equal to five percent (5%) of the total amount of the bid, or a bid bond for ten percent (10%) of the total amount of the bid. Bids shall be marked "Juvenile Detention Center Boiler Replacement".

The County reserves the right to reject any or all bids and to waive any informalities in the bidding.

A Pre-bid Conference will be held on Wednesday, June 28, 2017, at 9:00 AM near the south entrance of the Facility, 4200 S. West Ave, Sioux Falls, SD 57104. A walk-through of the work areas will follow.

_____
Bob Litz
Auditor
Minnehaha
County
Sioux Falls, South Dakota 57104

Publish:
Argus Leader: June 19 and June 26
Brandon Valley Challenger: June 21
Dell Rapids Tribune: June 21

INSTRUCTIONS TO BIDDERS

1. **Completing the Bid Form:** All bids must be made on the bid forms provided in the Project Manual. Information shall be typed or printed in ink. The preparer must initial erasures and/or corrections. Each bid must be signed in ink by the bidder or authorized officer.

2. **General Conditions:** AIA Document A201—2007 of the American Institute of Architects is hereby made a part of these specifications in its entirety unless otherwise revised, deleted, or supplemented herein.

3. **Price Discrepancies:** Any discrepancies between the bid unit price and extension shall be resolved in favor of the unit price. Incorrect extensions or totals will be corrected, and the corrected figures will be used in determining the low bidder.

4. **Firm Prices:** Unit prices awarded shall remain firm for the entire contract period.

5. **Quantities:** The quantity indicated for each item in the specifications is estimated only, and the Owner reserves the right to order less or more as dictated by actual needs.

6. **Excise Tax:** The 2% Realty Improvement Contractor's Excise Tax applies to this project. Contractors shall include the applicable tax in their bid price.

7. **Federal Tax ID Number:** Each bidder shall state its Federal Tax Identification Number on the line provided on the bid form.

8. **Bid Guaranty:** Each bid of $25,000 or greater must be accompanied by a bid bond in the amount of 10 percent of the amount of the bid, or in lieu thereof a certified check, cashier's check, or bank draft in the amount of 5 percent of the amount of the bid. All bid guaranties shall be made payable to Minnehaha County. Bonds shall be issued by a surety authorized to do business in this state. Checks shall be certified or issued by a State or National Bank. **Bid guaranties other than those mentioned will not be accepted by the Owner.** Bid guaranties of unsuccessful bidders shall be returned within 30 calendar days of the bid opening. Bid guaranty of the successful bidder shall be retained until the contract is executed and a performance guaranty (if applicable) has been submitted. If a successful bidder fails to enter into contract, the bid guaranty shall be forfeited to the District to compensate for administrative expenses of making a re-award or issuing a new request.

9. **No Bid Guaranty Required on Small Contracts:** No bid guaranty is required if the total bid price, including any alternates, is less than $25,000.

10. **Addenda:** The bidder shall acknowledge receipt of all addenda in the space provided in the bid form.

11. **Delivery of Proposals:** Each proposal shall be submitted in a sealed envelope with "Bid Proposal**"** and "Juvenile Detention Center Boiler Replacement" and "Due" date clearly printed on the front. When sent by mail, the sealed proposal shall be addressed as follows:

    Minnehaha County **Due: July 12, 2017**
    Juvenile Detention Center Boiler Replacement
    Bob Litz, County Auditor
    415 N. Dakota Ave
    Sioux Falls, SD 57104
    Bid Documents Enclosed

Proposals shall be filed prior to the time and at the place specified by the Notice to Bidders. Proposals received after the time for opening of bids will be returned to the bidder unopened.

All sealed bids must be received by no later than 10:15 AM on the date of opening. Bids received after 10:15 AM., at a location other than that specified will not be accepted. Bids will be publicly opened and read at 10:30.

12. **Withdrawal of Bids:** A bid may be withdrawn by the bidder by letter, telegram, facsimile, or in person before the time set for the opening of bids. No bid shall be withdrawn for a period of 30 (thirty) days after the bid opening.

13. **Local Preference:** By virtue of statutory authority, preference will be given materials, products, and supplies found or produced within the state of South Dakota. Bidders resident in South Dakota shall be allowed a preference over the bid of any bidder from any other state enforcing or having a preference for resident bidders, equal to such preference.

14. **Bid Results:** Results of bid openings will be available at the County Administration Office following tabulation of the bids. After an award has been made and signed by the County's representative, all bid proposals and related information will be on file in the County Administration Office for public review. The County will do all formal and informal notifications of bid awards.

15. **Method of Award:** This request will be evaluated and a contract award made to the lowest bid from a responsive and responsible bidder deemed to be in the best interest of the Owner.

16. **Contract:** The successful bidder(s) will be required to enter into contract by signature on separate contract documents which will be prepared by the Owner from information in this bid request and the successful bidder's response thereto.

17. **Performance and Payment Bond:** Performance and Payment bonds are required for all construction contracts totaling $25,000 or more.

18. **Right to Protest:** Any actual or prospective bidder, officer, or contractor who is aggrieved in connection with the solicitation or award of a contract may protest. The protesting bidder shall file a written statement with the County Administration Office within seven calendar days of the date the Owner's representative signed the bid award document.

19. **Questions:** Questions pertaining to this bid request shall be directed to:

    Ryan Van Der Bill, P.E, Associated Consulting Engineering, Inc.,
    340 S. Phillips Avenue, Sioux Falls, SD 57104 (605) 335-3720

    If the Owner deems it of general interest, the answer shall be issued in written addendum to each party that has been recorded on the plan holder's list.

20. **Insurance:** The Contractor entering into any contract for services shall secure the insurance specified below and shall cause all its consultants/subcontractors to do likewise. All insurance shall be issued by an insurance company(s) acceptable to the Owner. The insurance specified in this policy directive may be in a policy or policies of insurance, primary or excess. Certificates of all required insurance shall be provided to the Owner upon execution of any agreement. Exceptions to this policy must be approved by the Owner.

a. Workers' compensation. The policy shall provide the statutory limits required by South Dakota law. In addition, it shall provide Coverage B, Employer's Liability coverage of not less than $1,000,000 each accident, $1,000,000 disease-policy limits. The required limit may be met by excess liability (umbrella) coverage.

b. Commercial general liability. The policy shall provide occurrence form contractual, personal injury, bodily injury, and property damage liability coverage with limits of at least $1,000,000 per occurrence, $2,000,000 general aggregate, and $2,000,000 aggregate products and completed operations. The required limit may include excess liability (umbrella) coverage. The policy shall name the School District and its representatives as an additional insured. If "occurrence form" insurance is not available, "claims made" insurance will be acceptable. The policy shall be maintained for three years after completion of this contract.

c. Automobile liability. The policy shall cover all owned, non-owned, and hired automobiles, trucks, and trailers. The coverage shall be as broad as that found in the standard comprehensive automobile liability policy with limits of not less than $1,000,000 combined single limit each occurrence. The required limit may include excess liability (umbrella) coverage.

d. The Owner's acceptance of a certificate of insurance does not mean that the Owner assumes responsibility for its validity. Nor does it mean that the Owner represents that the coverage and limits required are adequate to protect the Contractor.

e. Successful bidder must furnish Builders All Risk insurance.

21. **Examination of Project Manual, Drawings, and Site of Work:** The bidder is required to examine the Project site, Project Manual, Drawings, and contract form for the work contemplated. The submission of a proposal shall be considered conclusive evidence that the bidder has investigated and is satisfied as to the conditions to be encountered, the character, quality, and quantities of work to be performed, materials to be furnished, and to the requirements of these specifications, supplemental specifications, special provisions, and contract forms. Failure to visit the site shall in no way relieve the successful bidder from the necessity of providing any materials or performing any work that may be required to complete work in accordance with the Drawings and Project Manual without additional cost to the Owner.

22. **Approval Request for Substitute Materials:** The Contractor shall use the materials or products specified by Manufacturer's name, brand, trade name, or catalog reference unless changed or approved by an Addenda or a Contract Modification. Where two or more materials or products are named, the choice of these shall be optional with the Contractor.

    Whenever a material, product, or piece of equipment is identified on the Drawings or in the Project Manual by reference to Manufacturer's or Vendor's names, trade name, catalog number, etc., it is intended merely to establish a standard; and any material, product, or equipment so proposed is, in the opinion of the Architect/Engineer, of equal substance and function.

    Prior to bid opening, Manufacturers, Suppliers, or other interested parties desiring consideration of products or materials other than those specified should submit a request in writing to the Architect/Engineer. Such request shall state name of the product or material specified, the name of the product proposed for substitution, name of Manufacturer, model, type, full description, and complete specification of each product or material he offers as a substitute.

Requests for such approval must be made to the Architect/Engineer no less than ten (10) days prior to the Bid opening. The approval of material or equipment as equal to that specified will be made in writing in the form of an Addendum issued by the Architect to all Drawing and Project Manual holders of record.

The Base Bid shall be based on material only as specified or approved by Addendum.

25. **Cancellation of Award:** The Owner reserves the right to cancel the award of a contract before the execution of said contract without liability against the Owner.

26. **Return of Bid Bond:** Bid bond will be returned to the successful bidder after a satisfactory performance bond has been furnished and a contract has been executed.

27. **Requirement of Performance Bond:** At the time of the execution of the contract, the successful bidder shall furnish performance and labor and material payment bond in a sum equal to the amount of the contract for the faithful performance of the contract, with the additional obligation that all persons supplying labor or materials in the prosecution of the work shall be promptly paid. The bond shall be issued by a surety authorized to do business in the state of South Dakota.

28. **Execution and Approval of Contract:** The contract shall be signed by the successful bidder and returned, together with the required bonds, within fourteen (14) days after the Owner has issued a Notice of Award. The Owner has thirty (30) days after Notice of Award to execute the Contract. A contract shall not be considered as effective until it has been executed by all parties thereto.

29. **Failure to Execute Contract**: Failure to execute the contract and file acceptable bonds within fourteen (14) days after the contract has been awarded may be just cause for the cancellation of the award and the forfeiture of the Bid Bond which shall become the property of the Owner, not as a penalty, but in liquidation of damages sustained. Award may then be made to the next lowest responsible bidder, or work may be re-advertised.

30. **Contract Documents:** Accompanying this Project Manual are the Drawings, which are complementary to the Specifications and intended to coordinate the Work of this Contract. Any Work included in one and not in the other shall be fully executed as though included in both.

    The intent of the Contract Documents is to include in the Contract Price the cost of all labor and material, water, fuel, tools, plant, equipment, lights, power, transportation, and all other expenses as may be necessary for the proper execution and completion of the entire Work.

31. **Builders Exchanges:** The contract documents are on file at several local builder’s exchanges.

END OF INSTRUCTIONS TO BIDDERS

FORM OF PROPOSAL

PROJECT: **Juvenile Detention Center Boiler Replacement**
Sioux Falls, South Dakota

TO: Minnehaha County
Bob Litz, County Auditor
415 N. Dakota Ave
Sioux Falls, South Dakota 57104

DATE: _____

The undersigned, having familiarized (itself) (himself) with the local conditions affecting the cost of the Work at the place where the Work is to be done and with the Drawings and Specifications and other Contract Documents, and having examined the location of the proposed Work, hereby proposes and agrees to perform any and all labor and to provide all materials, tools, and equipment necessary to complete in a workmanlike manner all the work for the construction of the Juvenile Detention Center Boiler Replacement, Sioux Falls, South Dakota, all in strict conformance with the Drawings and Specifications prepared by Associated Consulting Engineering, Inc., dated June 19, 2017:

For the following Base Bid:

_____($_____)

The undersigned agrees that his bid may not be withdrawn for a period of 30 days from the time set for opening of bids and that is notified of acceptance of his Proposal within that stated time, or at any time thereafter before the bid is withdrawn, he will within ten (10) days of such notification, execute and deliver an Owner - Contractor Agreement herein specified to be AIA Document A101 and to furnish and deliver the Performance Bond and the Labor and Material Payment Bond, each in an amount equal to 100 percent of the Contract Sum.

The Contractor shall commence work under this Contract after the date of receipt by him of Notice to Proceed, on or near **July 26, 2017, and shall complete the entire project for substantial completion by September 29, 2017.** The contractor acknowledges the Project Schedule as noted in Section 01100, Summary of Work. The time stated for completion shall include allowances for inspections, completion of items requiring further attention and final clean-up of premises.

BID SECURITY:

The undersigned has attached to the Proposal the following:

1. Bid Security in the form of _____ and in the amount of $_____ as outlined in the Invitation to Bid.

In submitting this bid, the undersigned understands that the right is reserved by the Owner to reject any and all bids and to waive all informalities.

BIDDER: _____

BY: _____

TITLE: _____

BUSINESS ADDRESS: _____

STATE OF INCORPORATION: _____
(SEAL)

If Bid is by a Corporation:

SUPPLEMENTARY CONDITIONS

1. INTRODUCTION

The following supplements modify, change, delete from, or add to the "General Conditions of the Contract for Construction," AIA Document A201, 2007 Edition.

2. ARTICLE 2—OWNER

Add the following sentence to subparagraph 2.1.1:

2.1.1 The term **Owner** shall mean Minnehaha County, Sioux Falls, South Dakota.

3. ARTICLE 3—CONTRACTOR

Add the following article:

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

Add the following subparagraphs:

3.3.4 ENVIRONMENTAL PROTECTION

The Contractor shall comply with all federal, state, and City laws and regulations controlling pollution of the environment. Precautions shall be taken to prevent pollution of streams, lakes, ponds, and reservoirs from harmful materials and to prevent pollution of the atmosphere.

Add the following subparagraph:

3.3.5 SOUND CONTROL REQUIREMENTS

The Contractor shall comply with all City noise ordinances and obtain necessary permits required by the ordinances. All engines used for any purposes on the job or related to the job shall be equipped with a muffler of a type recommended by the manufacturer and maintained in a satisfactory working condition.

4. ARTICLE 7—CHANGES IN THE WORK

Modify subparagraph 7.3.7 to read as follows:

If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditure and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement; or if no such amount is set forth in the Agreement, a reasonable amount in accordance with Clauses 7.3.11.1 through 7.3.11.6 below. In such case, and also under Clause 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with

appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this subparagraph 7.3.7 shall be limited to the following:

Add the following Subparagraph 7.3.11 to 7.3:

7.3.11 In Subparagraph 7.3.7, the allowance for the combined overhead and profit included in the total cost to the Owner shall be based on the following schedule:

1. For the Contractor, for work performed by the Contractor's own forces, 8 percent of the cost.
2. For the Contractor, for work performed by the Contractor's Subcontractor, 6 percent of the amount due the subcontractor.
3. For each Subcontractor or Sub-subcontractor's own forces, 8 percent of the cost.
4. For each Subcontractor, for work performed by the Subcontractor's Sub-subcontractors 6 percent of the amount due the subcontractor.
5. Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.7.
6. In order to facilitate checking of quotations for extras or credits, all proposals shall be accompanied by a complete itemization of costs including labor, materials, and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also.

5. ARTICLE 8—TIME

Add the following paragraph 8.4:

8.4 FAILURE TO COMPLETE ON TIME

8.4.1 Time is an essential element of the contract. It is important that the work be pressed vigorously to completion. The cost to the Owner of the administration of the Contract, including architectural, engineering, inspection, and supervision, will be increased as the time occupied in the work is lengthened. The public is subject to detriment and inconvenience when full use cannot be made of an incomplete project.

8.4.2 ~~Should the Contractor fail to complete the work within the time agreed upon in the contract or as allowed in increases in the contract or by formally approved extensions granted by the Owner, there shall be deducted from moneys or amounts due or that may become due the Contractor, the sum of~~ **~~$000.00 in liquidated damages~~** ~~for each calendar day, the work shall remain uncompleted. This sum shall be considered and treated not as a penalty but as liquidated damages due the Owner from the Contractor by reason of inconveniences to the public, added cost of engineering and supervision, and other items which have caused an expenditure of public funds resulting from failure to complete the work within the time specified in the contract~~.

8.4.3 Permitting the Contractor to continue and complete the work covered by the terms of the contract after the expiration of the working time provided for therein and inclusive of any extensions granted, shall in no way be construed as a waiver by the Owner of its rights under the contract.

6. ARTICLE 9—PAYMENTS AND COMPLETION

9.3 APPLICATIONS FOR PAYMENT

Add the following sentence to subparagraph 9.3.1.

9.3.1 The form of Application for Payment shall be notarized AIA Document G702, Application and Certification for Payment, supported by AIA Document G703, Continuation Sheet.

Delete subparagraph 9.3.2 and substitute the following:

9.3.2 Payment will not be made for materials delivered to, or stockpiled on, the Project and not yet incorporated in the work in their final position, except as specified hereinafter.

Partial payment may be made upon request by the Contractor on specific items which are to form a part of the completed work and which are stockpiled in a manner and location satisfactory to the Architect.

Payment on stockpiled materials as specified herein shall not be made on fuel; temporary structures of any kind which will not become an integral part of the finished construction, perishable material such as trees, plants, curing compounds, etc., unless specifically provided in the Contract, partial payment for structural and reinforcing steel will not be made prior to fabrication.

Materials for which an allowance is requested shall be stored in an approved manner. If at any time stored materials are lost or damaged, the Contractor will be responsible for repair and replacement of such damaged materials. If payment has been prior to such damage, the amount allowed or a proportionate part thereof shall be deducted from the next partial payment and withheld until satisfactory repairs or replacements have been made.

Payment will not be allowed for materials stored outside the Owner's property.

7. ARTICLE 10—PROTECTION OF PERSONS AND PROPERTY

10.2 SAFETY OF PERSONS AND PROPERTY

Add the following subparagraphs 10.2.9, 10.2.10, and 10.2.11.

10.2.9 WORK NEAR ENERGIZED ELECTRICAL LINES OR OTHER UTILITIES:

It shall be the Contractor's sole and exclusive responsibility (a) to provide personnel capable of working adjacent to energized electrical lines or other utilities; (b) to provide adequate, safe, and properly maintained equipment; (c) to conduct all of his work in accordance with the safety rules and regulations prescribed by the National Electrical Code, National Electric Safety Code, H30 and Safety Rules and Installation and Maintenance of Electrical Supply and Communications Lines Handbook 81, Occupational Safety and Health Act of 1970, as well as other safety codes in effect at the site of construction and as specified elsewhere here, and as are generally applicable to the type of work being performed; and (d) to continuously supervise and inspect the work

being performed to assure that the requirements of (a), (b), and (c) above are complied with and nothing in these Contract Documents shall be held to mean that any such responsibility is the obligation of the Owner or the Architect.

10.2.10 Notwithstanding any reference to any rules or regulations above or in any other parts of the Contract Documents, the Owner and Architect and anyone employed by either of them and anyone for whose acts either of them may be liable, are not assuming, neither jointly nor separately, any duty to provide supervision of construction methods or processes or safety measures. Any supervision shall be the sole and exclusive responsibility of the Contractor.

8. ARTICLE 11—INSURANCE AND BONDS

Delete subparagraphs 11.1.1, 11.1.2, 11.1.3 and substitute the following:

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 The contractor entering into any contract for services shall secure the insurance specified below and shall cause all its consultants/subcontractors to do likewise. All insurance shall be issued by an insurance company(s) acceptable to the Owner. The insurance specified in this policy directive may be in a policy or policies of insurance, primary or excess. Certificates of all required insurance shall be provided to the Owner upon execution of a contract. Exceptions to this policy must be approved by the Owner's legal counsel.

1. Workers' compensation. The policy shall provide the statutory limits required by South Dakota law. In addition, it shall provide Coverage B, Employer's Liability coverage of not less than $1,000,000 each accident, $1,000,000 disease-policy limits. The required limit may be met by excess liability (umbrella) coverage.

2. Commercial general liability. The policy shall provide occurrence form contractual, personal injury, bodily injury, and property damage liability coverage with limits of at least $1,000,000 per occurrence, $2,000,000 general aggregate, and $2,000,000 aggregate products and completed operations. The required limit may include excess liability (umbrella) coverage. The policy shall name the School District, and its representatives as an additional insured. If "occurrence form" insurance is not available, "claims made" insurance will be acceptable. The policy shall be maintained for three years after completion of this contract.

3. Automobile liability. The policy shall cover all owned, non-owned, and hired automobiles, trucks, and trailers. The coverage shall be as broad as that found in the standard comprehensive automobile liability policy with limits of not less than $1,000,000 combined single limit each occurrence. The required limit may include excess liability (umbrella) coverage.

4. The Contractor will provide the Owner with at least thirty days' written notice of an insurer's intent to cancel or not renew any of the insurance coverage. The Contractor agrees to hold the Owner harmless from any liability, including additional premium due because of the Contractor's failure to maintain the coverage limits required.

5. The Owner's acceptance of a certificate of insurance does not mean that the Owner assumes responsibility for its validity. Nor does it mean that the Owner represents that the coverage and limits required are adequate to protect the Contractor.

Add the following subparagraph:

11.6 UNEMPLOYMENT COMPENSATION

In accordance with SDCL 5-18-17, all Contractors for public improvements shall furnish the Owner prior to final payment, certification from the Department of Labor indicating payment of unemployment compensation contributions and interest due in the performance of the contract. The Contractor may obtain certification by contacting the address below:

South Dakota Department of Labor
Employment Insurance Division
P.O. Box 1730
Aberdeen, SD 57401
Phone: (605) 622-2312

9. ARTICLE 13—MISCELLANEOUS PROVISIONS

Add the following paragraph:

13.8 RIGHT TO AUDIT

13.8.1 Audit—The Contractor shall allow the Owner or its representatives access to inspect, audit, and or reproduce, or all three, any books, documents, papers, and records (in whatever form they may be kept—whether written, electronic, or other) or interview any of the Contractor's employees, all subcontractors and all suppliers, and their respective employees involving transactions related to the contract for two years after final payment.

10. ARTICLE 15—CLAIMS AND DISPUTES

Add the following subparagraph:

15.2.9 PERSONAL LIABILITY OF PUBLIC OFFICIALS—In carrying out any of the provisions of these specifications, or in exercising any power or authority granted to them by or within the scope of the architect, there shall be no liability upon the Owner of its authorized representatives, either personally or as officials of the Owner, it being understood that in all such matters they act solely as agents and representatives of the Owner.

Add the following subparagraph:

15.2.10 NO WAIVER OF LEGAL RIGHTS—The Owner shall not be precluded or stopped by any measurement, estimate, or certificate made either before or after the completion and acceptance of the work and payment therefore from showing the true amount and character of the work performed and materials furnished by the Contractor, nor from showing that any such measurement, estimate, or certificate is untrue or is incorrectly made, nor that the work or materials do not in fact conform to the Contract. The Owner

shall not be precluded or stopped, notwithstanding any such measurement, estimate, or certificate, and payment in accordance therewith, from recovering from the Contractor or his sureties, or both, such damages as it may sustain by reason of his failure to comply with terms of the Contract. Neither the acceptance of the Owner, or any representative of the Owner, nor any payment for or acceptance of the whole or any part of the work, nor any extension of time, nor any possession taken by the Owner, shall operate as a waiver of any portion of the contract or of any power herein reserved, or of any right to damages. A waiver of any breach of the contract shall not be held to be a waiver of any other or subsequent breach.

15.3 MEDIATION

Delete this paragraph in its entirety and all other references to mediation wherever they appear.

15.4 ARBITRATION

Delete this paragraph in its entirety and all other references to arbitration wherever they appear.

END OF SUPPLEMENTARY CONDITIONS

PROJECT DIRECTORY

PROJECT IDENTIFICATION:

JUVENILE DETENTION CENTER BOILER REPLACEMENT
SIOUX FALLS, SOUTH DAKOTA

OWNER:

Minnehaha County
500 N. Minnesota Ave.
Sioux Falls, South Dakota 57104

Owner's Representative: Mark Kriens
(605)-367-4241

MECHANICAL ENGINEER:

Ryan Van Der Bill, P.E.
Associated Consulting Engineering, Inc.
340 S. Phillips Ave.
Sioux Falls, South Dakota 57104-6319
(605) 335-3720

ELECTRICAL ENGINEER:

Brad Shoup, P.E.
Associated Consulting Engineering, Inc.
340 S. Phillips Ave.
Sioux Falls, South Dakota 57104-6319
(605) 335-3720

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PROJECT IDENTIFICATION:

JUVENILE DETENTION CENTER BOILER REPLACEMENT
SIOUX FALLS, SOUTH DAKOTA

DIVISION 1 - GENERAL REQUIREMENTS

DIVISION 22-23 – MECHANICAL

DIVISION 26 – ELECTRICAL

Specifications are on the drawings

SCHEDULE OF DRAWINGS

SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Access to site.
5. Coordination with occupants.
6. Work restrictions.
7. Specification and drawing conventions.

B. Related Section:

1. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Juvenile Detention Center Boiler Replacement.

1. Project Location: 4200 S. West Ave., Sioux Falls, SD 57105

B. Owner: Minnehaha County.

1. Owner's Representatives: Mark Kriens, Director of Facilities

C. Architect/Engineer: Associated Consulting Engineering, 340 S. Phillips Ave., Sioux Falls, SD 57104.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of the Project is defined by the Contract Documents and consists of the following:

1. Remove one existing boiler and associated venting, gas piping, heating piping, electrical connections, etc.

2. Install one boiler, venting, primary pump, gas piping, heating piping, boiler controls, electrical connections, combustion air fan, hydronic unit heater.

B. Type of Contract

1. Project will be constructed under a single prime contract.

1.5 PHASED CONSTRUCTION

A. The Owner will occupy the building during construction. The Contractor shall coordinate dates for all portions of the Work with the Owner. **See "Work Restrictions" below.**

B. Temporary cooling is not required. The contractor shall do piping modifications as soon as possible so that the existing chiller can be operational.

C. Before commencing Work and throughout the construction period, submit updated copies of the Contractor's construction schedule showing the sequence, commencement dates, and completion dates for all portions of the Work.

1.6 SCHEDULE

A. The contractor shall start the equipment shop drawing process, planning, etc. upon notice to proceed to expedite getting the new boiler back on line for fall heating requirements.

1.7 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Use of Site: Limit use of Project site to areas within the vicinity of work. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to areas in which the Work occurs.
2. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. 100% Supervision by the Owner: Due to the nature of this secure facility, an Owner's representative (most likely a maintenance technician) will need to be present in the building at all times the Contractor is working on site. The Contractor does not need to include any cost for the technician's time, but needs to consider this for scheduling and planning purposes.

1.8 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy the site and building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
2. Notify the Owner not less than 72 hours in advance of activities that will affect Owner's operations.

1.9 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.

B. On-Site Work Hours:
1. Work 7-3:30 M-F. (with some extended hours and Saturdays available is approved by the Owner) See notes above regarding supervision by the Owner.
2. Hours for Utility Shutdowns: As approved by Owner.
3. Hours for core drilling, jack hammering, concrete sawing, and other noisy activity of the like: Preferably outside of normal office hours, but as approved by Owner. The Owner is very willing to be flexible to allow for work to take place.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Controlled Substances: Use of tobacco products and other controlled substances on the Project site is not permitted.

END OF SECTION 01100

SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections:

1. Division 1 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect may issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 10 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 1 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

END OF SECTION 01250

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Administrative and supervisory personnel.
3. Requests for Information (RFIs).
4. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Sections:

1. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
2. Division 1 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information from each other during construction.

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 KEY PERSONNEL

A. Key Personnel Names: Within 5 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office and by each temporary telephone. Keep list current at all times.

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Architect's actions on submittals.
    f. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 1 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log at regular intervals to correspond with onsite project meetings. Software log with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Phasing.
c. Critical work sequencing and long-lead items.
d. Designation of key personnel and their duties.
e. Lines of communications.
f. Procedures for processing field decisions and Change Orders.

g. Procedures for RFIs.
h. Procedures for testing and inspecting.
i. Procedures for processing Applications for Payment.
j. Distribution of the Contract Documents.
k. Submittal procedures.
l. Preparation of record documents.
m. Use of the premises and existing building.
n. Work restrictions.
o. Working hours.
p. Owner's occupancy requirements.
q. Responsibility for temporary facilities and controls.
r. Procedures for disruptions and shutdowns.
s. Parking availability.
t. Office, work, and storage areas.
u. Equipment deliveries and priorities.
v. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Progress Meetings: Conduct progress meetings at approximately biweekly intervals, as will be determined during preconstruction conference.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Status of submittals.
2) Deliveries.
3) Off-site fabrication.
4) Access.
5) Site utilization.
6) Temporary facilities and controls.
7) Progress cleaning.

8) Quality and work standards.
9) Status of correction of deficient items.
10) Field observations.
11) Status of RFIs.
12) Status of proposal requests.
13) Pending changes.
14) Status of Change Orders.
15) Pending claims and disputes.
16) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

END OF SECTION 01310

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections:

1. Division 1 Section "Summary" for limitations on work restrictions and utility interruptions.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's project team, Architect, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices, General: It is anticipated that a field office will not be required.

B. Provide storage sized, furnished, and equipped to accommodate materials and equipment for construction operations, as required.

1. Store combustible materials apart from building.

2.2 EQUIPMENT

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Division 1 Section "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

C. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

3.3 SUPPORT FACILITIES INSTALLATION

A. Parking: Parking is available for use at no cost within 50 ft of the boiler room access door. One or more vehicles may be parked immediately outside of the boiler room door.

END OF SECTION 01500

SECTION 01781 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.

B. Related Sections:

1. Division 1 Section "Execution Requirements" for final property survey.
2. Division 1 Section "Closeout Procedures" for general closeout procedures.
3. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Divisions 2 through 16 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up record prints.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Locations and depths of underground utilities.
d. Revisions to routing of piping and conduits.
e. Revisions to electrical circuitry.
f. Actual equipment locations.
g. Duct size and routing.
h. Locations of concealed internal utilities.
i. Changes made by Change Order or Construction Change Directive.
j. Changes made following Architect's written orders.
k. Details not on the original Contract Drawings.
l. Field records for variable and concealed conditions.
m. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01781

SECTION 01782 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Operation manuals for systems, subsystems, and equipment.
3. Product maintenance manuals.
4. Systems and equipment maintenance manuals.

B. Related Sections:

1. Divisions 2 through 16 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual specification sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Where applicable, clarify and update reviewed manual content to correspond to modifications and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. Two paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return both copies.

C. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or modify each manual to comply with Architect's comments. Submit copies of each corrected manual to Owner within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each operation and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.

5. Name and contact information for Contractor.
6. Name and contact information for Architect.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

C. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

D. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

E. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

C. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.

D. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

E. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Division 1 Section "Project Record Documents."

F. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01782

SECTION 01820 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.

B. Related Sections:

1. Divisions 2 through 16 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved operation and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Documentation: Review the following items in detail:

a. Operations manuals.
b. Maintenance manuals.
c. Project record documents.
d. Identification systems.
e. Warranties and bonds.
f. Maintenance service agreements and similar continuing commitments.

2. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

3. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

4. Adjustments: Include the following:

    a. Alignments.
    b. Checking adjustments.
    c. Noise and vibration adjustments.
    d. Economy and efficiency adjustments.

5. Troubleshooting: Include the following:

    a. Diagnostic instructions.
    b. Test and inspection procedures.

6. Maintenance: Include the following:

    a. Inspection procedures.
    b. Types of cleaning agents to be used and methods of cleaning.
    c. List of cleaning agents and methods of cleaning detrimental to product.
    d. Procedures for routine cleaning
    e. Procedures for preventive maintenance.
    f. Procedures for routine maintenance.
    g. Instruction on use of special tools.

7. Repairs: Include the following:

    a. Diagnosis instructions.
    b. Repair instructions.
    c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
    d. Instructions for identifying parts and components.
    e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 1 Section "Operations and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

D. Cleanup: Collect used and leftover educational materials and remove from Project site**.** Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 01820

TABLE OF CONTENTS - MECHANICAL

DIVISION 22 - PLUMBING AND HEATING HYDRONICS

DIVISION 23 - HEATING, VENTILATION AND AIR CONDITIONING

PROJECT: JUVENILE DETENTION CENTER BOILER REPLACEMENT
SIOUX FALLS, SOUTH DAKOTA

ACEI PROJECT NO.: 117054

DATE: June 19, 2017

Project Manual sections prepared by or under the supervision of Ryan William Van Der Bill, Reg. No. 9407, include all sections of Division 22 & 23.

DIVISION 22 – PLUMBING AND HEATING

SECTION 220100 - GENERAL PROVISIONS

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

This Section pertains to general provisions and requirements for construction of work specified in all sections of Division 22 herein.

"Contractor" referred to in this Section of the specification implies the Contractor, Subcontractor and/or Subcontractors which are responsible for all or any part of the mechanical installation specified in Division 22 and/or as shown on the Contract Drawings.

Where the specifications in subsequent Sections of Division 22 conflict with requirements of this Section, the specifications in the subsequent Sections shall govern.

The Contractor shall provide all items, articles, materials, operations or methods listed, mentioned or scheduled on the Drawings and/or herein specified, including all labor, materials, equipment, accessories, wiring and incidentals necessary to be installed in accordance with manufacturer's recommendations except as otherwise approved.

1.02 PERMITS AND SERVICE CHARGES:

All permits and service charges necessary for execution of the work under this Contract shall be obtained by and be paid for by the Contractor. It shall be the responsibility of the Contractor to determine the permit requirements of the local authorities and utility companies and the cost of required permits, service charges, tap fees and development fees shall be included in the Contractor's bid.

All work shall be executed in accordance with all local, state and national rules, regulations, codes, etc., which are applicable and shall be subject to inspection by the proper authorities.

1.03 CODES AND STANDARDS:

All work performed and all equipment furnished under this Division of the Contract shall be manufactured and installed in strict accordance with all applicable codes and standards, including the applicable provisions of the following codes and standards.

1. Local and State Codes, Standards and Regulations.
2. National Fire Protection Association (NFPA).
3. National Electric Code (NEC).
4. Underwriter's Laboratory (UL).
5. American Gas Association (AGA) Standards.
6. Uniform Plumbing Code.
7. International Mechanical Code.
8. ASME Boiler and Pressure Vessel Codes.
9. State Boiler Safety Code.
10. American Waterworks Association (AWWA).

11. National Sanitation Foundation (NSF).
12. Williams-Steiger Occupational Safety and Health Act of 1970 (OSHA).
13. International Building Code.
14. Life Safety Code.
15. State Energy Conservation Standards.
16. Americans with Disabilities Act (ADA).

All materials installed shall have composite fire and smoke hazard ratings as tested by procedures ASTM 84, NFPA 255 and UL 723 not to exceed 25 Flame Spread and 50 Smoke Developed.

1.04 COMPLIANCE:

Where specific requirements of any code vary with the requirements of another code, the higher standard as determined by the Architect/Engineer shall govern the installation.

All equipment manufactured in accordance with the provisions of the above codes and standards shall bear the label of the respective association bureau thereon.

1.05 DRAWINGS:

In general, the Drawings of the mechanical systems and equipment are to scale. However, to determine exact locations of walls and partitions, the Contractor shall consult the architectural and/or structural drawings which are dimensioned. Drawings shall not take precedence over field measurements.

Drawings of piping and ductwork, although shown on scale drawings, are diagrammatic only. They are intended to indicate size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail or exact arrangement of construction. If it is found, before installation of any or all construction phases, that a more convenient, suitable or workable arrangement of any or all phases of the project would result by varying or altering the arrangement indicated on the Drawings, the Architect/Engineer may require the Contractor to change the location or arrangement of the work without additional cost to the Owner. Such rearrangement shall be in accordance with directions from the Architect/Engineer.

Where discrepancies are discovered after certain portions or phases of the work have been installed, the Architect/Engineer reserves the right to require the Contractor to make changes in pipe, duct, fixture or equipment locations or arrangements to avoid conflicts with work at no additional cost to the Owner.

Because the Drawings are to a relatively small scale to show as large a portion as is practical, the fact that only certain features of the system are indicated does not mean that other similar or different features or details will not be required. The Contractor shall furnish all incidental labor, material or equipment for the systems so that each system is a complete and operating one unless otherwise specifically stipulated in the detailed body of the specifications.

The Contractor, Subcontractor's and their respective trades shall cooperate in laying out their work so it will fit properly into the space provided. Promptly report to the Architect/Engineer any delay or difficulties encountered in the installation of this work which might prevent prompt and proper installation, or make it unsuitable to connect with or receive the work of others. Failure to so

report shall constitute an acceptance of the work of other trades as being fit and proper for the execution of this work.

1.06 SUBSTITUTIONS AND PRODUCT OPTIONS:

The Contractor and equipment suppliers shall read and familiarize themselves with articles concerning substitution of materials, as indicated in the Instructions to Bidders. Material and equipment substitutions will be handled as follows:

Materials or equipment specified by name of manufacturer, brand, trade name or catalog reference, shall be furnished under the contract unless changed by Addenda or a Contract modification. Where two (2) or more materials are named, the choice of these shall be optional with the Contractor.

Material or equipment followed by the phrase "or equal" shall establish a standard of required function, dimension, appearance and quality to be met by any proposed substitute. No substitution will be considered unless written request for substitution has been submitted by the bidder and has been received by the Architect/Engineer at least ten days prior to the date for receipt of bids. The Architect/Engineer's decision on a proposed substitute shall be final. If the Architect/Engineer considers any proposed substitution equal, such will be set forth in an Addendum. Bidders shall not rely upon substitutions made in any other manner.

Should the Contractor wish to use materials or equipment other than those specified or listed as equal by Addenda, he shall attach his proposed substitution along with the appropriate add or deduct to the Contract amount, should the substitution be accepted. Substitutions proposed by the Contractor will not be considered in the award of the Contract.

1.07 SHOP DRAWINGS:

Refer to the requirements of the General Conditions. Unless indicated otherwise in the General Conditions, submit to the Architect/Engineer one electronic copy of Shop Drawings for each item of equipment to be installed under this contract. Furnish additional Shop Drawings as required for coordination with General Contractor and other Subcontractors.

To the extent practical, complete sets of shop drawings for each specification section shall be submitted. In the case that a particular item is required to be expedited, that particular item may be submitted individually.

Submit shop drawings punched in PDF format.

Furnish Shop Drawings as follows:

1. For all major items of equipment or materials, regardless of whether the item is to be furnished as specified.
2. For all equipment, systems or devices where Shop Drawings are specifically called for.
3. For all minor items of equipment or materials where the Contractor proposes to deviate from the specified and/or scheduled manufacturer or material.

The Contractor shall check all Shop Drawing submittals for size, capacity, arrangement, connection locations, materials, finish, color, electrical characteristics, accessories, and shall so

note the Shop Drawings prior to submittal to the Architect/Engineer. Any deviation from the Drawings and Specifications shall be indicated.

Shop Drawings will be reviewed by the Architect/Engineer, and copies of Shop Drawings will be returned to the Contractor. Shop Drawings shall be submitted sufficiently in advance of the construction schedule to allow time for checking Drawings, resubmittal and rechecking when necessary.

Any equipment or material which is installed without authorization by properly processed Shop Drawings will be subject to removal by the Contractor and reinstallation as directed, without cost to the Owner. All cost for repair for damages as may be incurred to the structure as a result of the above correction shall be paid by this Contractor.

Shop drawing material quantities will not be checked by the Architect/Engineer, and review of Shop Drawings by the Architect/Engineer shall not be construed to be verification of the material quantities and sizes shown on the Shop Drawings. Quantities, sizes, dimensions and locations shown on the Drawings and as specified shall determine material requirements.

1.08 CLEANING:

The Contractor and/or Subcontractors for the various phases of the work shall clear away all debris, surplus materials, etc., resulting from their work or operations, leaving the job and equipment furnished under any or all contracts in a clean first class condition.

Permanent heating and ventilating systems shall not be used during the construction period unless the project site is in a clean and dust free condition and shall be subject to the approval of the Architect/Engineer and Owner.

Air surfaces of all coils, heaters, boilers, pumps and mechanical equipment shall be wiped clean or washed if required, leaving the installation in a first class condition. All throwaway filters used during construction shall be replaced.

1.09 PAINTING:

Painting of materials and equipment furnished under the mechanical portion of the contract shall be as described in Division 9 - FINISHES. Contractor shall refinish and restore to the original condition and appearance, all mechanical equipment which has sustained damage to the manufacturer's prime and finish coats of enamel or paint. Materials and workmanship shall be equal to the requirements described in Division 9 - FINISHES.

1.10 RECORD DRAWINGS:

The Contractor shall keep a complete set of all mechanical drawings in the jobsite office for purpose of showing the installation of mechanical systems and equipment. This set of drawings shall be used for no other purpose. Where any materials equipment or system components are installed different from that shown on the Architect/Engineer's drawings, such differences shall be clearly and neatly shown on this set of drawings using ink or indelible pencil. At the completion of the project, the record set of drawings shall be turned over to the Architect/Engineer and shall become his property.

1.11 STERILIZATION OF WATER SUPPLY SYSTEM:

All domestic water systems shall be sterilized with sufficient chlorine to provide a dosage of not less than 200 ppm with a contact period of not less than 3 hours, and with all valves in line opened and closed at least three times during the sterilized period. Following the contact period, the water is to be thoroughly flushed from the system until the residual chlorine content is not more than 0.20 ppm.

A certificate of completion shall be provided.

1.12 OPERATING INSTRUCTIONS:

The Contractor shall furnish the Owner two (2) sets of complete catalog data, manufacturer's literature and detailed manuals covering the operation and maintenance of all equipment specified under this Division. All such literature shall be bound in an amply sized three-ring binder and submitted to the Architect/Engineer for approval and for eventual transmittal to the Owner. The manual shall have a Table of Contents at the front of the manual.

The Contractor shall also supervise the initial operation of all equipment and instruct the operator selected by the Owner in such operation as required to acquaint him thoroughly with the equipment.

1.13 DELIVERY AND STORAGE OF MATERIALS:

Make provisions for delivery and safe storage of materials on the jobsite and make arrangements with other Contractors for introduction into the building of equipment too large to pass through finished openings. Materials to be delivered at such stages of the work as will expedite the work as a whole and marked and stored in such a way as to be easily checked and inspected. All stored equipment shall be protected from the weather conditions and construction debris with a protective covering securely tied in place.

1.14 MECHANICAL PROVISIONS:

Mechanical equipment shall operate without objectionable noise or vibration, as determined by the Architect/Engineer. If such noise or vibration should be produced and transmitted to occupied portions of the building by apparatus, piping, or other parts of the mechanical work, make necessary changes and additions, as approved, without extra cost to Owner.

Provide oil level gauges, grease cups and grease gun fittings for machinery bearings as recommended by the manufacturer. Extend oil or grease fittings by copper tubing to readily accessible locations.

1.15 CONCRETE BASES:

Existing concrete housekeeping pad shall be used.

1.16 COORDINATION OF WORK:

The Contractor shall process shop drawings and order equipment and materials expeditiously after receiving the Contract and the mechanical installation shall be substantially complete when the general construction work is completed. This Contractor shall confer and cooperate with all other

Contractors on this project and shall arrange his work in proper relation to the work of others. Each Contractor shall furnish, install, and maintain in place all anchors, inserts, sleeves, etc., required for his work. Each Contractor will also be held solely responsible for proper size and location of all anchors, inserts, sleeves, chases, recesses, openings, bases, etc., required for proper installation of his work. All cutting and patching made necessary by failure or neglect to coordinate with other Contractors shall be the responsibility of this Contractor. Any cutting or patching shall be subject to the direction and approval of the Architect/Engineer and all damage due to cutting or patching shall be repaired by this Contractor.

After being instructed by this Contractor to do so, the General Contractor will leave all openings in roof, walls, floors, etc., for the passage of pipes, etc. The General Contractor shall also provide concrete bases and roof curbs where shown for mounting the mechanical equipment unless specified otherwise. This Contractor shall verify the exact size and location required for installation of his equipment with the General Contractor.

In general, the Division 26 – Electrical Contractor will provide all power wiring and make one power connection to each item of mechanical equipment, as outlined under Electrical Section.

1.17 GUARANTEE:

All mechanical equipment including equipment used during construction for temporary purposes shall be guaranteed for a period of one year after the time of final acceptance of this work and shall be in like new condition at time of final acceptance.

1.18 TEMPORARY HEAT:

The building heating systems shall not be used for temporary heating purposes without written approval of the Architect/Engineer.

Use of the building permanent heating systems prior to substantial completion is subject to the written approval of the Architect/Engineer and extended warranties shall be provided at no additional cost.

No temporary heat shall be necessary due to the time of year when the work is completed.

1.19 ELECTRICAL:

Electric Motors:

All electric motor driven equipment being furnished and installed under Division 22 of these specifications shall be complete with electric motors, unless specified otherwise.

All electric motors shall be as manufactured by Westinghouse, Century, Wagner, Allis Chalmers, Reliance, General Electric, or equal. Bearings shall be ball type with alemite lubricating fittings extended to an easily accessible location for field servicing. Minimum service factors for all motors shall be 1.15. All motors shall conform to applicable NEMA standards and all motors specified for use in hazardous locations shall bear the stamp of approval of the Underwriter's Laboratories. All motors, except direct connected motors, shall be furnished complete with cast iron or stamped steel adjustable slide rails. Single phase motors shall be capacitor start type, drip proof, unless specified otherwise. All motors shall be single speed and shall operate at 1,750 RPM, unless specified otherwise.

Horsepower Rating: All electric motors shall be sized to meet the horsepower requirements of the driven unit at design characteristics including all V-belt and/or drive and coupling losses which are incurred without loading the motor beyond its nameplate horsepower rating. Where V-belt drives are employed, the motor horsepower nameplate ratings shall not be less than 120 percent of the driven unit brake horsepower requirements.

Single Phase Motors: Unless specifically noted otherwise, all electric motors shall be designed for operation in an ambient temperature not exceeding 40 degrees C., continuous duty and shall be designed for use with voltage as scheduled on Drawings or specified, 60 cycle alternating current. Motors shall be thermally protected.

Three Phase Motors: All electric motors shall be designed for operating in an ambient temperature not exceeding 40 degrees C., continuous duty and shall be designed for use with voltage as scheduled on Drawings or specified, 60 cycle alternating current.

All motors less than 3/4 horsepower shall be 115 volt, single phase unless designated otherwise and all motors 3/4 horsepower and larger shall be as specified in the specific section or as noted on the Drawings.

Premium Efficiency Motors:

Premium efficiency motors shall be furnished on all mechanical equipment where 1 horsepower or larger motors are required.

Motors shall be designed with special stator steel for reduced core losses. Windings shall be oversized copper placed for maximum efficiency. Stator and rotor shall be extra long to reduce flux losses. Frame shall be ODP (unless specified otherwise) of cast iron or cast aluminum construction.

Motors shall be squirrel cage, horizontal base mount, ball bearing, NEMA B design, Class B design, Class B insulation, continuous duty, 1.15 SF, 40 degrees C. ambient.

Minimum nominal full load motor efficiencies shall be based on ASHRAE Standard 90 (latest edition).

Motors shall be similar to Louis Allis "Spartan" Series, Gould "E-Plus" Series, or Westinghouse "MAC II" Series. Manufacturer shall furnish proof of efficiency rating.

Motor Starters:

Except where specifically described as being furnished as a part of the equipment furnished and installed under Division 22 of these specifications, all motor starters will be furnished and installed under Division 26, ELECTRICAL.

Electrical Wiring:

Except where specifically described as being furnished as a part of the equipment furnished and installed under Division 22, all electric power wiring shall be furnished and installed in Division 26, ELECTRICAL. The Electrical Contractor will make one power connection to each item of mechanical equipment, unless specified otherwise.

Electrical wiring furnished and installed under these specifications shall conform to all applicable requirements of Division 26, ELECTRICAL.

Unless otherwise indicated, all motors and controls shall be furnished, set in place and wired in accordance with the following schedule:

Item	Division Furnished Under	Set in Place or Mounted Under	Division Wired & Connected Under
Equipment Motors	22	22	26
Magnetic Motor Starters:			
Automatically controlled, with or without HOA switches	26	26	26
Automatically controlled, with or without HOA switches and furnished as part of factory wired equipment	22	22	26
Manually controlled	26	26	26
Manually controlled and furnished as part of factory wired equipment	22	22	26
Line voltage thermostats, time clocks, etc., not connected to control panel systems	22	26	26
Electric thermostats, time clocks, remote bulb thermostats, motor valves, float controls, etc., which are an integral part or			

directly attached to ducts, pipes, etc.	22	22	22
Temperature control panels and time switches mounted on temperature control	22	22	22
Motor valves, solenoid valves, EP and PE switches, etc.	22	22	22
Alarm bells	22	22	22
Control circuit feeders	26	26	26
Low voltage controls, thermostats, valves, etc.	22	22	22
Pushbutton stations, pilot lights	26	26	26
Disconnect switches, thermal overload switches, manual operating switches	26	26	26
Contactors	26	26	26
Control relays, transformers	22	26	26

All control wiring and controls as noted on the Drawings and/or as specified in these specifications shall be provided by this Contractor, including items set in place and wired and connected by the Division 26 Contractor, unless specifically shown otherwise on the Drawings.

1.20 EQUIPMENT SUPPORT:

Furnish and install all necessary wall backing, brackets, braces, plates, angles, wall hangers, etc., required for properly supporting mechanical equipment and mechanical appurtenances. All supports shall be securely anchored with lead inserts, expansion shields, through-going bolts, lag screws or other devices as required.

All items of mechanical equipment hung from overhead structure shall be hung from 2-1/2 inches by 2-1/2 inches by 3/16 inch angles minimum which shall span at least 3 members, unless noted otherwise.

1.21 EXISTING SERVICES:

The Contractor shall verify the exact location of all existing building services extended and/or relocated for this project. The Contractor shall also verify the exact location and take proper precautions to protect all services which may be encountered during construction.

All active services which are encountered shall be protected, braced and supported where required for proper execution of the work and without interruption of the service if possible.

All inactive services which are encountered shall be protected or removed as directed by the Architect/Engineer, Owner, Utility Company or Municipal Agency having jurisdiction. The service shall also be plugged or capped as directed.

When active services must be temporarily interrupted, the interruption shall be scheduled at night or at such time as approved by the Owner or authority having jurisdiction and so as to cause the minimum of interference with establishing operating routine. Arrangements shall be made to work continuously including overtime if required, to assure that services will be interrupted only as long as actually required to complete necessary work.

1.22 ACCESS TO EQUIPMENT:

Access shall be provided to all motors, valves, controls, specialties, etc., for maintenance purposes. All access doors, access panels, removable sections, etc., required for access shall be provided. The location of the access openings relative to the mechanical equipment shall be coordinated to assure proper access to the equipment. The door shall maintain any ratings of the wall, ceiling, etc. that it penetrates.

Access openings are required for valves and other devices requiring access and shall be provided in the ductwork, plenums, housings, tanks, walls, ceilings, etc., under this portion of the Contract.

1.23 PROTECTIVE DEVICES:

All sheaves, belts, drives, couplings, and moving parts shall be protected by approved permanent guards, shields, or railings, which shall be in place whenever the equipment is in operation and shall be in accordance with applicable safety standards.

All pressure and/or temperature relief valves shall have the discharge piped full size to within 6 inches of the floor or floor drain. The piping shall be securely anchored. All relief valves shall be ASME approved and proper size for the application.

1.24 PIPE AND PIPE FITTINGS:

Furnish and install where shown on the Drawings and required to connect fixtures and equipment, pipe and fittings of type and material for the various services as noted below. At all exposed fixture supply connections, nipples are required between copper tubing and fixtures, such nipples shall be standard weight full iron pipe size chrome-plated brass pipe nipples with suitable brass or copper adapters. Steel or iron nipples will not be permitted in any location in copper lines where connections are made to brass fixtures, valves or trim. Compression stops may be used when fitted tight against the wall escutcheon with no exposed copper piping. Sweat adapters and chrome plated cover tubes may be used when the cover tube extends the entire pipe from the elbow in the wall or chase to the flush valve and fits tight.

Piping that is not shown on the Drawings, which is obviously necessary for complete systems, shall be provided and shall be amply sized in accordance with applicable codes and standards.

All welding fittings shall be Tube Turn, Taylor Forge, B & W, Ladish Yoloy, or equal.

Grooved pipe fittings, valves and couplings shall be Victaulic, Anvil Gruvlok, Central Sprink, Star or equal. All components shall be supplied by one manufacturer.

Plastic piping shall not be used in air plenums or in buildings classified as noncombustible construction.

The piping for the various systems shall be as follows:

Hot water heating supply and return shall be Schedule 40 black steel or copper pipe as follows:

Schedule 40 black steel pipe shall conform to ASTM A120/ASTM A53 and Federal Specification WW-P-406, Weight A. Sizes 2 inch and smaller shall have screwed ends. Sizes 2-1/2 inch and larger shall have plain ends for welding. Fittings shall be 125 pound screwed, banded, black cast iron for sizes 2 inch and below, and standard weight welding fittings (use long radius ells) for sizes 2-1/2 inch and larger. Welding flanges shall be used adjacent to equipment and valves. Welding rods as recommended by ASTM Specification A233. Welding rings shall be used at all joints.

The Contractor may use grooved steel pipe, grooved fittings and mechanical couplings as manufactured by Victaulic, Grinnell, Anvil Gruvlok or equal on all systems recommended by the manufacturer. Grooved piping systems including valves, fittings, etc., shall be supplied by only one manufacturer. Grooving tools shall be supplied by the same manufacturer as the grooved components. Grooved fittings shall be ASTM A536 ductile iron or ASTM A53 forged or fabricated carbon steel with grooved ends designed to accept grooved joint couplings of the same manufacturer. Coupling gaskets shall be Grade EPDM suitable for hot water systems up to 250 deg F. Rigid style coupling housings shall be cast with offsetting, angle-pattern bolt pads to provide system rigidity. Flexible style couplings shall be installed where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. Three (3) couplings, for each connection, shall be placed in close proximity to the source of the vibration.

Copper piping shall be hard drawn Type L copper tubing, ASTM B88 and Federal Specification WW-T-799. Fittings shall be wrought copper solder type, ANSI B16.22. Joints for pipe and fittings shall be made with No. 95-5 (tin-antimony) solder and No. 50 non-corrosive flux.

The Contractor may use roll grooved copper tubing, grooved fittings and mechanical couplings as manufactured by Victaulic, or equal, on all systems recommended by the manufacturer. Grooved piping systems including valves, fittings, etc., shall be supplied by only one manufacturer. Grooving tools shall be supplied by the same manufacturer as the grooved components. Fittings shall be

ASME B16.22 wrought copper or ASME B16.18 bronze casting with copper tube dimensioned grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted). Housings shall be cast with offsetting, angle pattern bolt pads coated with copper-colored enamel. Gasket shall be Grade EPDM suitable for hot water systems up to 250 deg F.

The grooved coupling manufacturer's factory-trained field representative (direct employee) shall provide on-site training to the Contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. The factory-trained representative shall periodically review product installation. The Contractor shall remove and replace any improperly installed products.

Natural gas piping shall be standard weight black mild steel pipe, ASTM A120/ ASTM A53 and Federal Specification WW-P-406. Fittings for exposed gas piping up to and including 2 inch size shall be standard weight black malleable iron screwed fittings. Fittings 2-1/2 inch size and larger and in all concealed locations shall be welding type. There shall be no unions installed in concealed locations. All underground gas piping shall be welded and shall be wrapped with bituminous paper for corrosion protection. A manual shut-off valve, union, and pressure regulator shall be installed at each item of mechanical equipment with a gas connection. A manual shut-off valve shall be installed at all gas connections.

1.25 VALVES:

Furnish and install valves in piping where so indicated on the Drawings. In addition, shut-off valves shall be provided in piping adjacent to each item of equipment, fixtures, etc., and at the base of all water risers.

All cold water and chilled water valves shall have an extended operator stem and insulation sleeve to accommodate the pipe insulation and vapor barrier.

All gate and globe valves shall be installed with stem in a vertical position wherever possible.

Of the several manufacturers listed, the Contractor is to standardize on one make as much as practical but not to the extent of sacrificing quality listed. Valves shall be Milwaukee, Crane, Powell, Stockham, Walworth, Victaulic, Grinnell, Anvil Gruvlok, Watts, Nibco, Hammond or equal.

The valves designated in the following schedule are fully described in the valve list following this schedule.

Valve Service	Valve Designation
Shut-Off Valves For:	
Natural Gas	
Pipe sizes 2 in. and smaller	V-9
Pipe sizes 2-1/2 in. and larger	V-11
Circulating Heating Water	

Pipe sizes 2 in. and smaller	V-1 or V-2
Pipe sizes 2-1/2 in. and larger	V-5 or V-13

Balancing Valves For:

Circulating Heating Water

Pipe sizes 2 in. and smaller	V-1
Pipe sizes 2-1/2 in. and larger	V-13

Check Valves For:

Circulating Heating Water

Pipe sizes 2 in. and smaller	V-4
Pipe sizes 2-1/2 in. and larger	V-8

The following is a list of valves types from which valves for use on this project have been selected. See the valve service schedule preceding this list for types to be used on each service.

(V-1) Ball Valves (Fed. Spec. WW-V-35b,): Bronze body ball valve, conventional port, lever handle, screwed or soldered and teflon seats and stem packing, 150 psi SWP, 400 psi WOG, Milwaukee BA-100 or BA-150, 1/2 inch through 2 inch size. Provide Memory Stop on all valves used for balancing purposes.

(V-2) Gate Valves (Fed. Spec. WW-V-54c, Class A. Type II): Bronze body gate valve, rising stem, solid bronze wedge, screw-in bonnet, threaded or soldered ends, teflon packing, 125 psi SWP, 200 psi WOG, 1/4 inch through 2 inch size, Milwaukee 148 or 149.

(V-4) Bronze Check Valve (Fed. Spec. WW-V-5ld, Class A, Type IV): Bronze check valve, horizontal swing regrinding type, Y-pattern, renewable disc, 125 psi SWP, 200 psi WOG, 1/4 inch through 2 inch size, Milwaukee 509 or 1509.

(V-8) Iron Body Check Valve: Iron body swing check valve, bolted bonnet, horizontal swing renewable seat and discs, flanged, bronze trim, 125 psi SWP, 200 psi WOG, 2-1/2 inch size and larger, Milwaukee F-2974.

(V-9) Plug Cock: Bronze body square head cock, screwed, 150 psi 1/8 inch through 2 inch size, Lunkenheimer 454.

(V-11) Lubricated Plug Valve: Semi-steel body lubricated plug valve, wrench operated, 100 percent area, rectangular port, screwed or flanged, teflon stem seal, natural gas service, 125 psi SWP, 150 psi WOG, Homestead 602.

(V-13) Butterfly Valve: Wafer or lug type iron body butterfly valve, extended neck, stainless steel shaft, bronze disc, EPT seal and seal with 275 degrees F. temperature rating, lever operated up through 6 inch valve size and gear and crank operator over 6 inch valve size, 150 psi WOG, 2-1/2 inch size and larger Milwaukee "M" series.

1.26 PIPING CONNECTIONS:

Furnish and install unions or mating flanges at all connections to each piece of equipment, conveniently located to facilitate quick and easy disconnecting of equipment for replacement, tube cleaning or general maintenance. Flanged or union connections shall be used on both sides of equipment connections, control valves, pressure reducing valves, meters, tanks, pumps and the like. Unions or flanges shall be of the same material or finish as the piping systems in which they are installed. Unions are not required for grooved pipe systems.

Dielectric unions, flanges, or waterways shall be installed in hydronic piping systems, domestic hot, cold and recirculating water lines where copper or brass piping is connected to ferrous material such as steel piping, steel tanks, steel water heater, etc. Dielectric unions 2 inch size and smaller shall be steel body and nut with insulating gasket and copper connector, 250 psi rating at 190 degrees F., EBCO Model FX, FB, or EA. For 2-1/2 inch size and larger, the union shall be flanges, cast iron with insulated gasket and copper connector, 175 psi rating at 190 degrees F., EBCO Model GX or GA.

Grooved pipe and mechanical joint couplings may be utilized in certain piping systems with Architect/Engineer approval. See section on pipe and pipe fittings.

1.27 PIPE HANGERS, SUPPORTS AND ANCHORS:

Anchors as shown and detailed on the Drawings and specified herein and/or as required. All support components shall conform to Manufacturer's Standardization Society Specification SP-58. The hangers shall adequately support the piping system. They shall be located near or at changes in piping direction
and at concentrated loads. They shall provide vertical adjustment to maintain pitch required for proper drainage. They shall allow for expansion and contraction of the piping. On other than vapor barrier insulated lines, hangers shall bear directly on piping.

Hangers shall be constructed of malleable or wrought iron unless noted otherwise, and hangers supporting copper pipe shall be copper plated. Hangers for pipe 3 inches and smaller shall be band and socket Michigan Model No. 100 or equal. For piping over 3 inches, hangers shall be adjustable, Clevis type, Michigan Model No. 400 or equal.

Where groups of three or more pipes occur, they may be supported with trapeze hangers using two hangers as specified with a capped pipe cross member.

Where clearance between pipe and overhead support is insufficient for the use of other hangers specified, use Michigan Model No. 605 or equal.

Horizontal steel or cast iron piping shall be supported as follows:

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1-1/4 inch	3/8 inch	8 feet
1-1/2 inch & 2 inch	3/8 inch	10 feet
2-1/2 inch & 3-1/2 inch	1/2 inch	15 feet
4 inch & 5 inch	5/8 inch	15 feet
6 inch	3/4 inch	17 feet
8 inch through 12 inch	7/8 inch	22 feet

Horizontal copper piping shall be supported as follows:

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1 inch	3/8 inch	6 feet
1-1/4 inch & 1-1/2 inch	3/8 inch	8 feet
2 inch	3/8 inch	9 feet
2-1/2 inch	1/2 inch	9 feet
3 inch & 4 inch	1/2 inch	10 feet

For vertical piping, where supports are not indicated on the Drawings, support steel and copper pipe at every other floor,

Pipe hangers shall not be attached to the roof deck. Hangers shall be attached to the structure with beam clamps, beam attachment and brackets bolted to joists and beams. Use Michigan Model No. 340 or equal, steel washer plates for pipe supported from steel joist. The Contractor shall endeavor to hang near joist panel joints wherever possible.

Pipe hangers for cold piping and all insulated piping on trapeze hangers shall be large enough to encompass the insulation, using a metal shield so the vapor barrier jacket will not be broken. See Insulation Section.

Pipe mounting brackets for cold piping shall be large enough to encompass the insulation B-Line Model B2417 or equal. This piping shall be anchored securely at the point of connection to plumbing fixtures. The last mounting bracket adjacent to fixtures and equipment may clamp directly onto the pipe. A short length (18 inches maximum) of piping between the last bracket and the connection is allowed without insulation.

Hanging from one pipe to another is prohibited.

Pipe Hangers shall be Michigan, Grinnell, PHD, B-Line or equal.

1.28 PIPING INSTALLATION:

All pipes shall be round and straight, of required size. Cutting shall be done with proper tools and pipes shall be reamed to full size after cutting.

Piping shall be properly enclosed, supported, guided, anchored, sway braced, connected, tested, cleaned and flushed out and shall be properly insulated and protected where required.

All pipes shall be run with proper grade to provide for easy draining and in group runs where applicable and in a neat and orderly manner, to the satisfaction of the Architect/Engineer. Lines required to be enclosed in ceiling, chaseways or similar spaces shall be installed to permit such enclosure as intended. All pipe runs shall be carefully laid out and scheduled to avoid necessary interferences with other work. Pipe sizes shown on the Drawings are nominal pipe sizes and not outside diameters.

Pipes shall be run substantially as indicated on the Drawings. However, the Architect/Engineer reserves the right to require this Contractor to make changes in pipe locations where conflicts occur with other trades. Such changes shall be made without extra cost to the Owner.

Piping shall be installed with ample provisions for expansion and contraction to prevent injury to the same and to the building construction. Such provision shall be made by means of piping offsets, changes in direction, expansion loops and/or suitable expansion joints. Suitable anchors and guides shall be provided to permit proper deflection and compression of offset loops and expansion joints. Expansion joints shall not be used in lieu of offsets, changes in direction or loops, except where specified and/or indicated on the Drawings or where otherwise obviously necessary.

Exposed piping shall be installed in a sanitary manner for ease in cleaning. Pipe shall be cut and threaded to fit the installation. Wherever possible, rough-in exposed pipe connections at the wall rather than the floor for ease in cleaning.

Equipment piping shall also include wastes and drains which are safe-wasted without a direct connection.

Minimum grade for horizontal drainage piping shall be 1/4 inch per foot for 3 inch diameter piping or less, 1/8 inch per foot for 4 inch and 6 inch diameter piping and 1/16 inch per foot for drainage piping over 6 inch diameter.

1.29 WELDED PIPING SYSTEMS:

The following specification covers permissible assemblies for welded pipe lines for all services operating at 160 psig or less.

All welding shall be performed by certified welding operators and in accordance with procedures recommended in the latest revision of the Code for Pressure Piping ASA B31.1. No welding may be done prior to a welding certificate being submitted and accepted for the person or persons designated to do all the welding.

The use of mitered elbows in welded lines will not be permitted. Welding elbows shall be used for all bends.

Mitered tees will not be permitted in welded lines. Connections shall be made with welding tees. The use of weldolets will be permitted in lieu of welding tees in welded lines provided they are installed in prefabricated assemblies and the pipe interior is cleaned of slag. Field installation of weldolets will be permitted where the branch piping is one-half the size of the main piping or less.

Mitered reducers will not be permitted in welded lines. Reduction in lines shall be made with welding reducers.

Pipe caps in welded lines may be fabricated from flat steel plate cut round and inserted into the pipe a sufficient depth to permit a fillet weld equal to the plate thickness. The plate thickness shall be twice the pipe wall thickness for pipe sizes 12 inches or less.

The pipe ends in all tees, laterals and reducers shall be carefully prepared to provide for proper weld penetrations in accordance with ASA Standards. Long radius, reducing type, butt welding elbows, in size 2-1/2 inch and larger, shall be used at pump and equipment connections wherever a change in pipe size and a 90 degree change in direction are involved.

Butt welding tees, forged steel socket welding tees or forged steel welding outlet fittings shall be used for making branch connections in welding piping systems.

Pipe ends and other pipe joints which are to be welded shall be carefully prepared to provide for proper weld penetration.

1.30 PRESSURE GAUGES:

Furnish and install U.S. Gauge Model 5105 or equal pressure gauges in pipelines and on equipment as indicated herein and/or where shown on the Drawings. Gauges shall have phosphor bronze bourdon tube with brass movement.

Gauges shall be compound, pressure or vacuum as required with 4-1/2 inch diameter dial. Each gauge shall be complete with Trerice No. 872 pressure snubbers, and brass ball valves. Ball valves shall be provided on all gauges at the inlet and outlet of each and all heating circulating pumps.

The normal operating pressure of each gauge shall be 50-70 percent of full scale. The range of the scale shall be suitable for the application.

The gauges shall be located and mounted such that they can be conveniently read by a person standing on the equipment room floor. Accuracy shall be Grade "A". Case shall be aluminum.

Pressure gauges shall be provided on each pump with shut off valves arranged to read both sides of the pump with a single gauge. Pressure gauges shall be provided on boiler primary pumps.

Pressure gauges shall be U.S. Gauge, Trerice, Weksler, Ashcroft, Weiss or equal.

1.31 THERMOMETERS:

Furnish and install Weiss "Thriftline" TL5S2 or TS5A2 or equal thermometers in pipelines and equipment as tabulated and/or where shown on the Drawings. Thermometers shall have a minimum of 6 inch scale with separable socket, cast aluminum case, red reading mercury, industrial type complete with thermometer wells.

The normal operating temperature of each thermometer shall be at 50-70 percent of full scale. The range of the scale shall be suitable for the application.

Thermometer installation will not be accepted unless they can be easily read by an operator standing on the floor.

Thermometers shall be provided at the inlet and outlet of each and all boilers, heat exchangers, and storage tanks supply and return piping. Thermometers shall also be required on the outlet of all domestic water mixing valves.

Thermometers shall be Weiss, Trerice, Weksler or equal.

1.32 PRESSURE/TEMPERATURE TEST PORTS:

Furnish and install where indicated on the Drawings or tabulated below pressure/temperature test ports. Port shall be solid brass with valve cores capable of receiving either temperature or pressure

probe with 1/8 inch o.d. Cores shall be Neoprene when application maximum temperature is 200 degrees F. or less and 500 psi, or Nordel for temperature up to a maximum of 275 degrees F. at 500 psi.

Pressure/temperature test ports shall be installed at each and all heat/cooling coil inlets and outlets. On coils with 3-way control valves an additional port shall be required between the control valve discharge and the balance valve or flow meter.

Provide test ports at the inlet and outlet of each and all heat exchangers supply and return piping unless permanently mounted pressure and temperature measuring devices are indicated elsewhere in the specifications or shown on the Drawings.

Test Plugs shall be Sisco, Pete's or equal.

END OF SECTION 220100

SECTION 220600 - HEATING

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

Section 220100, General Provisions, in its entirety, including references to the General Construction Specifications, are hereby adopted and made a part of these specifications.

The work involved in this specification and the accompanying drawings consists of performing all labor and furnishing of all materials, fixtures and equipment necessary to install complete heating system as described herein, and/or as shown on the Drawings. This includes all piping, equipment, wiring and materials obviously necessary for complete systems though not specifically mentioned or shown.

See Section 220700 for insulation requirements.

1.02 PROPELLER UNIT HEATERS:

Furnish and install Propeller Unit Heaters where shown on the Drawings. Unit sizes, types, performance and equipment shall be as tabulated in the schedule on the Drawings.

Cabinet shall be manufactured from die formed heavy gauge continuous galvanized steel. Cabinets shall be finished with a baked-on enamel to provide durable protection. Horizontal unit heaters shall have adjustable louvers for adjustable air flow.

Units shall have 115/60/1 single speed, sleeve bearing, permanent split capacitor motors with oilers, inherent thermal overload protection with automatic reset and resilient mounts. Units shall have a unit mounted “on-off” switch.

Manufacturer shall provide all units with fan guards which meet OSHA requirements.

Units shall be furnished with high efficiency coils. Standard coils shall be rated up to 150 PSIG and up to 366 degrees F in temperature. High pressure coils shall be rated for up to 350 PSIG and 450 degrees F in temperature. All units with steam pressure above 25 PSIG shall have high pressure coils.

Horizontal air flow units shall have double deflection louvers.

Propeller Unit Heaters shall be Trane, McQuay, Airtherm, Carrier, Beacon Morris, Dunham-Bush, Sterling, Modine, Rittling, Sigma or equal.

1.03 STRAINERS:

Furnish and install, where shown on the Drawings, and where required, a "Y" type strainer.

Strainers shall have steel or brass bodies, with 20 mesh stainless steel screens. The pressure drop shall not exceed 0.1 PSI at rated flow. All strainers shall be rated at 125 psig steam working

pressure minimum and 200 psig water working pressure minimum. All strainers shall be provided with a blowdown valve.

Strainers shall be Hoffman, Dunham-Bush, Sarco, Clark-Reliance, Armstrong, Illinois, Titan or equal.

1.04 AIR VENTS:

On each heating and cooling element, at the top of each heating or cooling pipe riser, and wherever required to vent the system, furnish and install a Taco No. 400, Bell & Gossett No. 4V or equal air vent.

1.05 HEATING AND COOLING ELEMENT VALVING:

Hot Water Unit Heaters: Install shutoff valves on the supply side of the coil and balancing valves on the return side. Where temperature control valves are used, the manual valves shall be installed to isolate both the temperature control valve and the coil.

See Drawings for additional valving requirements.

1.06 BOILER PRIMARY IN-LINE CIRCULATING PUMPS:

Boiler primary in-line circulating pumps are to be provided with the boiler and shall meet the following specifications:

Furnish and install "in-line" centrifugal circulating pumps similar to Bell & Gossett Series 80 or equal.

Pumps shall be complete with cast iron volutes, bronze impellers, carbon steel shafts, and mechanical seals. Bronze sleeve pump bearings shall be oil lubricating. Pump and motor shall be close-coupled with a flexible spring type coupler for quiet operation. Pump motors shall be premium efficiency.

Circulating pumps shall be Bell & Gossett, Taco, Armstrong, Amtrol, Patterson, Grundfos, or equal.

1.07 STANDARD EFFICIENCY NATURAL GAS FIRED HOT WATER BOILER:

GENERAL PRODUCT DESCRIPTION:
Furnish and install a single or series of modular steel boilers that are capable of responding in

parallel (via a common main) without water flowing into the inactive units. Each boiler shall be

fired with natural gas. Boiler/burner package must be UL listed and labeled. Acceptable boiler

designed for Hot Water and/or Domestic Hot Water applications.

Boilers shall be in accordance with Section IV of the ASME Boiler and Pressure Vessel Code and

must be tested, stamped, and approved for 125 psi operating pressure and bear the ASME symbol. Each boiler shall be registered with the National Board of Boiler and Pressure Vessel Inspectors.

Each boiler shall be properly packaged for shipping. All specified boiler trim and controls must be factory pre-piped, wired, and assembled before shipment. Any items removed for shipment shall be field installed by the contractor.

BOILER SIZE AND RATINGS

Each unit shall have a rated input and output as scheduled and shall operate at 30 PSI working pressure. Supply water temperature shall not exceed 180 degrees F and return water temperature shall not be lower than 140 degrees F.

BOILER DESIGN:

Boilers shall be of a vertical fire tube design and fired with UL listed burners, completely assembled and wired to NEC specifications. Burner shall be mounted on the lower part of the boiler. The combustion chamber shall be surrounded by water (water-backed). The bottom of the combustion chamber shall be insulated with high temperature castable refractory and an additional layer of high temperature blanket. Vessel walls shall be 1/4" thick boilerplate. Top and bottom tube sheets shall be 3/8" thick boilerplate. Fire tubes shall be of 12 gauge material.

There shall be fire tubes at 2" in diameter. Each fire tube shall include an angular Brock turbulator to maximize heat transfer efficiency.

Fire tubes shall be expanded/rolled into the upper and lower tube sheets; welding of tubes to tube sheet will not be permitted. Inner shell shall be 5/16" think boilerplate. Top and bottom tube sheets, tubes, and mud ring shall be accessible on the waterside for easy inspection and cleaning through at least 4 cleanout openings. Fire tubes shall be easily accessible for removal of turbulators and for cleaning or repair. Boilers shall include a drain and be set on structural steel rails with two lifting lugs. Each boiler shall be encased in a 22-gauge painted steel jacket insulated with refractory ceramic fiber blanket with a classification of at least 1800 degrees F, providing for low thermal conductivity.

All valves, fixed orifices, and associated piping shall be as recommended by the manufacturer.

BOILER TRIM:
The following trim items shall be integral to the boiler and factory installed and wired. All boiler

controls shall be UL Listed or Recognized.

- Provide a Hydrolevel Operating Limit Control for sequence of operation as specified.
- Provide a Safety High Limit Control that is a second high-limit with manual reset that prevents burner operation above nominal operating conditions.
- Provide a low water cutoff control with manual reset.
- High Visibility "Call for Heat" Light to indicate when the boiler circuitry has been activated.
- Provide a primary circulating pump properly sized for the boiler MBH output and temperature delta.
- Combination Pressure/Temperature gauge of suitable range for monitoring operations.
- On/Off switch.

- ASME Section IV approved relief valve.

BURNER EQUIPMENT:

The horizontally mounted burner will be placed so that combustion takes place within the water-backed furnace of the boiler. The burner shall be as scheduled power burner and fire natural gas. The burner and gas train shall be of a design that produces flame retention with rapid mixing of the fuel and combustion air. Each burner shall be designed and constructed as an integrated combustion system package. Each burner shall be of welded steel construction and the firing head will incorporate a stainless steel flame retention diffusor. The entire fuel burner system and its installation shall conform to applicable codes. The UL listed burner shall contain pre-wired controls and a gas train in compliance with and meeting ASME & CSD-1 standards. Burners will comply with UL-796 for gas burners and UL 296 for oil burners.

The burner shall normally operate without objectionable noise, vibration, or pulsation with not more that 20 percent excess air and with no CO in the products of combustion. The burner to boiler interface shall allow for ready installation and removal for inspection and cleaning. All air required for combustion shall be supplied by a blower mounted integral to the burner. The gas train shall consist of a manual shutoff cock, main gas pressure regulator, main motorized gas valve, auxiliary solenoid gas valve, leak test cock and a butterfly type gas flow control valve.

The burner shall also include:

- Air Safety switch to prevent operation until sufficient combustion is achieved.
- Flame rod sensor or UV Scanner
- Gas electric pilot with 6000 volt ignition transformer.
- Field adjustable combustion air damper.
- Low/high/low firing sequence with low-high controller.

All control components shall be mounted and wired within an integral burner mounted control panel with an easy access lift off cover and a Power On and Main Fuel indicating lights and an On/Off control switch.

Units shall require only setting on floor with ready attachment to required power, suitably provided

fuel, adequate venting, and appropriate water to operate.

TESTS

Boilers shall be inspected via a hydrostatic test in the presence of a National Board Commissioned

inspector who shall also certify a Data Report to be supplied with the boiler for ASME Code

compliance. The boiler shall have a National Board Registration Number and an ASME symbol.

Factory tests will also be conducted to check all controls on the boiler.

OPERATING MANUAL

A manual detailing the Operations, Maintenance and Installation will be included with each boiler.

A wiring diagram will also be included.

WARRANTY

Warranty shall include 1 year parts and workmanship; 10 year limited warranty on pressure bound vessel.

Boiler Primary Pump:
The boiler primary pump shall be furnished with the boiler, see pump spec section for more detail. See pump schedule on the drawings for assumptions made for head loss external to the boiler.

Boilers shall be Triad, or approved equal.

1.08 WATER TREATMENT:

Only new piping and equipment within the mechanical room shall be cleaned and/or flushed as needed. The Contractor shall take care to remove oils, cuttings, and other debris from piping that is installed to prevent contamination of new and existing equipment.

1.09 HYDRONIC FLUID / GLYCOL:

The intention is to capture and reinstall the existing hydronic system fluid. Capture all of the fluid which is drained out of piping and equipment for demolition and modifications. Store the fluid in clean barrels with lids, or similar. Any remaining fluid shall be turned over to the Owner after the system is refilled. Existing fluid tested to 25% propylene glycol, which is acceptable.

1.10 AUTOMATIC TEMPERATURE CONTROL:

Install the automatic temperature control valves, openings for water monitoring devices, flow switches, wells, alarms and control devices as provided by the Automatic Temperature Control Contractor. These valves and devices shall be installed under the direct supervision of the Section 230900, AUTOMATIC TEMPERATURE CONTROL Contractor and in strict accordance with the manufacturer's recommendations.

1.11 CALIBRATED BALANCE VALVE:

Furnish and install a Bell & Gossett Circuit Setter or equal calibrated balance valves of the sizes shown on the Drawings. Valves 3 inch size and smaller shall be Model CB and over 3 inches shall be Model OP. Each valve setter shall be of bronze construction for 125 psi and 250 degrees F.

Each valve in cold piping shall have an extended operator stem with insulation sleeve and extended pressure/temperature test ports to accommodate the pipe insulation and vapor barrier.

All valves shall include a balance valve either integral with the calibrated balance valve or immediately downstream from the flow fitting.

Calibrated Balance Valves shall be Bell & Gossett, Taco, Gerand, Flowset, Presco, Victaulic, Nexus, Pro Hydronics or equal.

1.12 AUTOMATIC FLOW CONTROL VALVES:

Contractor shall provide and install Griswold, AutoFlow or equal Automatic Pressure compensating Automatic Flow Control Valves where shown on the Drawings. Each kit shall include an Automatic Flow Control Valve, two shut-off valves, and various accessories. Contractor shall provide replacement cartridges as necessary for system balancing.

Automatic Flow Control Valves (FCV) shall automatically control flow rates with +/- 5% accuracy over an operating pressure differential range of at least 14 times the minimum required for control. Two operating pressure ranges shall be available with the minimum range requiring less than 3 PSID to actuate the mechanism. Valve internal control mechanism shall consist of a passivated stainless steel one-piece cartridge with segmented port design and full travel linear coil spring. Dual pressure or pressure/temperature test valves for verifying the pressure differential across the cartridge and system temperature shall be standard. Manufacturer shall provide certified independent laboratory tests verifying accuracy of performance.

Ball Valves integral to the automatic flow control valves shall be made of Bronze and rated for 600 WOG.

P/T Adapter for supply side shall include a pressure/temperature test valve for measuring temperature and/or pressure differential across the terminal unit. Provide a metal identification tag with chain for each installed valve. The tag shall be marked with zone identification and rated flow in gpm.

All components shall be warranted by manufacturer for no less than five years from date of purchase.

Correct flow shall be verified by establishing that the operating pressure differential across the valve tappings is within the range indicated on the submittal data sheet for that model number.

Each valve in cold piping shall have an extended operator stem with insulation sleeve and extended pressure/temperature test ports to accommodate the pipe insulation and vapor barrier.

Automatic Flow Control Valves shall be Griswold, Autoflow, Nexus, Pro Hydronics or equal.

1.13 TESTS:

General:

The Contractor shall furnish a competent individual familiar with the installation to assist the Balancing Company and make the necessary mechanical equipment adjustments as directed by the Balancing Company. The Contractor shall also furnish the necessary ladders, scaffolding, etc., needed for access to test and balance all systems.

The Contractor shall provide replacement pulleys, etc. as required to properly balance the heating equipment.

The following tests shall be performed on the respective systems. Tests shall be repeated until each system is proven acceptable.

Heating and Cooling:

The Contractor shall make an operating test of the heating and chilled water systems and all relating equipment.

At a time set by Contractor and agreed to by the Owner, the Contractor shall arrange to place the heating plant in operation and to make necessary adjustment to equipment, and to prove satisfactory operation prior to turning over to the Owner.

The operating test shall cover a total running period of 24 hours and all pertinent data shall be presented to the Owner as an indication of the proper operation of the plant.

The Contractor shall cooperate with and assist the independent Testing and Balancing Company specified in Section 230800 - VENTILATION AND AIR CONDITIONING to properly balance the water flow to and from all coils and equipment and make any adjustments necessary to meet the required flows.

All piping systems installed by the Contractor shall be tested with a pressure equal to 150 percent of the normal operating pressure for the specific systems (100 psi minimum).

END OF SECTION 220600

SECTION 220700 – PLUMBING AND HEATING INSULATION AND PIPING IDENTIFICATION

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

Section 220100, General Provisions, in its entirety, including references to the General Construction Specifications are hereby adopted and made part of these specifications.

The work involved in this specification and the accompanying Drawings consists of performing all labor and furnishing of all labor, materials, fixtures, and equipment necessary to install complete piping, and equipment insulation as described herein and/or as shown on the Drawings. This includes all equipment and materials obviously necessary for complete systems though not specifically mentioned or shown.

1.02 MATERIALS AND WORKMANSHIP:

All covering and insulating materials used on this project must contain the manufacturer's name on the containers. All materials must be dry and in good condition, free of defects, mildew, rough ends, etc. Insulation materials shall be Certainteed, Owens-Corning, Johns Manville, Armstrong, Knauf or equal.

All insulation work shall be performed by an Insulation Contractor who uses workers skilled in this type of work. Only first class workmanship will be acceptable. The Insulation Contractor shall submit shop drawings for all materials proposed to be installed in this project.

All pipe covering shall have a density of not less than 3-1/2 pounds per cubic foot.

All materials shall have composite fire and smoke hazard ratings as tested by procedures ASTM 84, NFPA 255, AND U.L. 723 not to exceed 25 Flame Spread and 50 Smoke Developed.

1.03 PIPING AND VESSELS INSULATION:

All pipe covering shall be furnished with a factory-applied all service jacket. **All-Service jacket shall have a polymer film exterior surface.** All longitudinal joints shall be sealed with adhesive such as Benjamin Foster 30-35, or equal, or factory applied self-sealing laps. All end joints shall be sealed with 3 inches wide butt strips of material identical to pipe covering jackets, using adhesive or self-sealing jacket. No stapling will be permitted on any vapor-barrier jackets. No vapor-barrier work or self-sealing laps or lap work shall be installed when temperatures are below 40 degrees F.

Insulation shall be continuous through properly sized wall and floor sleeves with no joints within 12 inches of the penetration. Where a fitting is adjacent to the wall a continuous section of insulation must extend from the fitting to 12 inches beyond the other side of the wall.

Wrap pipe at penetrations of fire or smoke barriers with firestop pipe insulation, seal jacket seam and seal end joints to adjacent sections of insulation. Seal opening between insulation and pipe sleeve with firestopping material.

All insulation installations shall conform to ASHRAE Standard 90.1.

1.04 FITTING AND EQUIPMENT INSULATION:

Insulate all fittings, valves, flanges and strainers with mitered segments of pipe insulation wired in place and premolded PVC plastic covers. Plastic covers shall be taped and sealed with a continuous vapor barrier on all cold systems. Plastic covers shall be Zeston or equal.

The Contractor shall allow for the removal and replacement of four (4) fitting or joint covers selected by the Architect/Engineer for inspection purposes. If any of the removed covers reveal unsatisfactory installation as determined by the Architect/Engineer, four (4) additional covers may be removed and replaced. Fitting covers may be removed and replaced four (4) at a time until the system installation is satisfactory.

For fittings where premolded PVC plastic covers are not available, coat each fitting with two 1/8 inch coats of an approved vapor-barrier mastic such as Childers CP-30 or equal. Reinforce each fitting by wrapping with glass fabric cloth extending 2 inches onto adjacent pipes and finish with additional coating of mastic worked into mesh of cloth to provide a smooth finish.

Coat vapor barrier penetrations, including insulation end butts, piping brackets, valve operator stems, etc., with two 1/8 inch coats of an approved vapor-barrier mastic. Trim the insulation at valve handle operators to allow for valve operation without damaging the vapor barrier. Insulation mastic for cold systems shall be Childer's CP-30 or equal for cold system vapor barriers. Vapor barrier shall be rated at 0.02 perms or less in accordance with ASTM E96 procedures.

Corner beads shall be used on all square corners.

Insulation shall be cut or mitered where necessary to fit the contour of the fittings and equipment. All voids shall be packed with light density glass fiber insulation. Insulation sections shall be banded in place with 3/4 inch x 0.015 inch thick galvanized steel bands at 18 inch o.c. for all large equipment. Insulation shall be covered with one inch galvanized hexagonal wire mesh. Apply 1/2 inch of insulating cement such as OC-110 or equal in 2 layers over the wire mesh.

On all cold systems, insulation shall be impaled over welding pins at 12 inches o.c. and secured in place with speed washers. The 3/4 inch steel bands will not be required. Each layer of insulation shall have a vapor barrier cover to provide complete airtight envelope. Vapor-barrier shall consist of one layer of Ludflow foil barrier paper smoothly adhered to the insulation cement surface with vapor-barrier lap adhesive. Lap all joints a minimum of 3 inch and seal with vapor-barrier lap adhesive.

1.05 HOT PIPING AND VESSELS:

The following systems shall be insulated with the following minimum thicknesses of glass fiber insulation:

MINIMUM PIPE INSULATION – INTERNATIONAL ENERGY CONSERVATION CODE & ASHRAE 90.1
Based on thermal conductivity (k) of 0.23 btu-in./hour-ft^2-°F
on a flat surface at 75^o F. mean

	Fluid	Insulation Thickness for Pipe Sizes					
Piping System	Temp. Range	1" &	1-1/4"	2”	2-1/2"	5	8" &

Types	Deg.F.	Under	to 1 1/2"		to 4"	to 6"	Over
Hot Water Heating Systems -							
Low Temp	120-200	1.0	1.0	1.5	1.5	1.5	2.0

1.06 PIPING IDENTIFICATION:

Identify all piping, insulated and uninsulated, except where concealed inside walls or below floors, with 1 inch high black letters designating the type of service and an arrow in the direction of flow. The lettering shall be applied after all painting of the piping is complete as specified in Division 9 - FINISHES. The lettering shall have an identifying word or phrase such as, cold water, gas, sprinkler, low pressure steam return, etc. Each pipe shall be identified in every room, at 30 feet intervals maximum and at each change in direction.

To standardize the lettering and abbreviations, use the following listing:

Heating Water Supply (HWS). (any piping between the boiler and heating coils)

Heating Water Return (HWR). (any piping between the heating coils and boiler)

Gas (GAS).

1.07 EQUIPMENT IDENTIFICATION:

All pieces of mechanical equipment shall be identified with an identification name plate to match the name designated on the drawings. Names plates shall not be hand written and shall be permanently fixed to the piece of equipment.

END OF SECTION 220700

DIVISION 23 – VENTILATION AND AIR CONDITIONING

SECTION 230100 - GENERAL PROVISIONS

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

This Section pertains to general provisions and requirements for construction of work specified in all sections of Division 23 herein.

"Contractor" referred to in this Section of the specification implies the Contractor, Subcontractor and/or Subcontractors which are responsible for all or any part of the mechanical installation specified in Division 23 and/or as shown on the Contract Drawings.

Where the specifications in subsequent Sections of Division 23 conflict with requirements of this Section, the specifications in the subsequent Sections shall govern.

The Contractor shall provide all items, articles, materials, operations or methods listed, mentioned or scheduled on the Drawings and/or herein specified, including all labor, materials, equipment, accessories, wiring and incidentals necessary to be installed in accordance with manufacturer's recommendations except as otherwise approved.

1.02 PERMITS AND SERVICE CHARGES:

All permits and service charges necessary for execution of the work under this Contract shall be obtained by and be paid for by the Contractor. It shall be the responsibility of the Contractor to determine the permit requirements of the local authorities and utility companies and the cost of required permits, service charges, tap fees and development fees shall be included in the Contractor's bid.

All work shall be executed in accordance with all local, state and national rules, regulations, codes, etc., which are applicable and shall be subject to inspection by the proper authorities.

1.03 CODES AND STANDARDS:

All work performed and all equipment furnished under this Division of the Contract shall be manufactured and installed in strict accordance with all applicable codes and standards, including the applicable provisions of the following codes and standards.

1. Local and State Codes, Standards and Regulations.
2. National Fire Protection Association (NFPA).
3. National Electric Code (NEC).
4. Underwriter's Laboratory (UL).
5. American Gas Association (AGA) Standards.
6. Uniform Plumbing Code.
7. International Mechanical Code.
8. ASME Boiler and Pressure Vessel Codes.
9. State Boiler Safety Code.
10. American Water Works Association (AWWA).
11. National Sanitation Foundation (NSF).
12. Williams-Steiger Occupational Safety and Health Act of 1970 (OSHA).

13. International Building Code.
14. Life Safety Code.
15. State Energy Conservation Standards.
16. Americans with Disabilities Act (ADA).

All materials installed shall have composite fire and smoke hazard ratings as tested by procedures ASTM 84, NFPA 255 and UL 723 not to exceed 25 Flame Spread and 50 Smoke Developed.

1.04 COMPLIANCE:

Where specific requirements of any code vary with the requirements of another code, the higher standard as determined by the Architect/Engineer shall govern the installation.

All equipment manufactured in accordance with the provisions of the above codes and standards shall bear the label of the respective association bureau thereon.

1.05 DRAWINGS:

In general, the Drawings of the mechanical systems and equipment are to scale. However, to determine exact locations of walls and partitions, the Contractor shall consult the architectural and/or structural drawings which are dimensioned. Drawings shall not take precedence over field measurements.

Drawings of piping and ductwork, although shown on scale drawings, are diagrammatic only. They are intended to indicate size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail or exact arrangement of construction. If it is found, before installation of any or all construction phases, that a more convenient, suitable or workable arrangement of any or all phases of the project would result by varying or altering the arrangement indicated on the Drawings, the Architect/Engineer may require the Contractor to change the location or arrangement of the work without additional cost to the Owner. Such rearrangement shall be in accordance with directions from the Architect/Engineer.

Where discrepancies are discovered after certain portions or phases of the work have been installed, the Architect/Engineer reserves the right to require the Contractor to make changes in pipe, duct, fixture or equipment locations or arrangements to avoid conflicts with work at no additional cost to the Owner.

Because the Drawings are to a relatively small scale to show as large a portion as is practical, the fact that only certain features of the system are indicated does not mean that other similar or different features or details will not be required. The Contractor shall furnish all incidental labor, material or equipment for the systems so that each system is a complete and operating one unless otherwise specifically stipulated in the detailed body of the specifications.

The Contractor, Subcontractor's and their respective trades shall cooperate in laying out their work so it will fit properly into the space provided. Promptly report to the Architect/Engineer any delay or difficulties encountered in the installation of this work which might prevent prompt and proper installation, or make it unsuitable to connect with or receive the work of others. Failure to so report shall constitute an acceptance of the work of other trades as being fit and proper for the execution of this work.

1.06 SUBSTITUTIONS AND PRODUCT OPTIONS:

The Contractor and equipment suppliers shall read and familiarize themselves with articles concerning substitution of materials, as indicated in the Instructions to Bidders. Material and equipment substitutions will be handled as follows:

Materials or equipment specified by name of manufacturer, brand, trade name or catalog reference, shall be furnished under the contract unless changed by Addenda or a Contract modification. Where two (2) or more materials are named, the choice of these shall be optional with the Contractor.

Material or equipment followed by the phrase "or equal" shall establish a standard of required function, dimension, appearance and quality to be met by any proposed substitute. No substitution will be considered unless written request for substitution has been submitted by the bidder and has been received by the Architect/Engineer at least ten days prior to the date for receipt of bids. The Architect/Engineer's decision on a proposed substitute shall be final. If the Architect/Engineer considers any proposed substitution equal, such will be set forth in an Addendum. Bidders shall not rely upon substitutions made in any other manner.

Should the Contractor wish to use materials or equipment other than those specified or listed as equal by Addenda, he shall attach his proposed substitution along with the appropriate add or deduct to the Contract amount, should the substitution be accepted. Substitutions proposed by the Contractor will not be considered in the award of the Contract.

1.07 SHOP DRAWINGS:

Refer to the requirements of the General Conditions. Unless indicated otherwise in the General Conditions, submit to the Architect/Engineer one electronic copy of Shop Drawings for each item of equipment to be installed under this contract. Furnish additional Shop Drawings as required for coordination with General Contractor and other Subcontractors.

To the extent practical, complete sets of shop drawings for each specification section shall be submitted. In the case that a particular item is required to be expedited, that particular item may be submitted individually.

Submit shop drawings punched in PDF format.

Furnish Shop Drawings as follows:

1. For all major items of equipment or materials, regardless of whether the item is to be furnished as specified.
2. For all equipment, systems or devices where Shop Drawings are specifically called for.
3. For all minor items of equipment or materials where the Contractor proposes to deviate from the specified and/or scheduled manufacturer or material.

The Contractor shall check all Shop Drawing submittals for size, capacity, arrangement, connection locations, materials, finish, color, electrical characteristics, accessories, and shall so note the Shop Drawings prior to submittal to the Architect/Engineer. Any deviation from the Drawings and Specifications shall be indicated.

Shop Drawings will be reviewed by the Architect/Engineer, and copies of Shop Drawings will be returned to the Contractor. Shop Drawings shall be submitted sufficiently in advance of the construction schedule to allow time for checking Drawings, resubmittal and rechecking when necessary.

Any equipment or material which is installed without authorization by properly processed Shop Drawings will be subject to removal by the Contractor and reinstallation as directed, without cost to the Owner. All cost for repair for damages as may be incurred to the structure as a result of the above correction shall be paid by this Contractor.

Shop drawing material quantities will not be checked by the Architect/Engineer, and review of Shop Drawings by the Architect/Engineer shall not be construed to be verification of the material quantities and sizes shown on the Shop Drawings. Quantities, sizes, dimensions and locations shown on the Drawings and as specified shall determine material requirements.

1.08 CLEANING:

The Contractor and/or Subcontractors for the various phases of the work shall clear away all debris, surplus materials, etc., resulting from their work or operations, leaving the job and equipment furnished under any or all contracts in a clean first class condition.

Permanent heating and ventilating systems shall not be used during the construction period unless the project site is in a clean and dust free condition and shall be subject to the approval of the Architect/Engineer and Owner.

Air surfaces of all coils, fan housings, fan wheels, fan motors, air unit plenums, all air filters, and mechanical equipment shall be wiped clean or washed if required, leaving the installation in a first class condition. All throwaway filters used during construction shall be replaced.

The surfaces of all equipment shall be cleaned, and each item shall be left in a first class condition.

1.09 RECORD DRAWINGS:

The Contractor shall keep a complete set of all mechanical drawings in the jobsite office for purpose of showing the installation of mechanical systems and equipment. This set of drawings shall be used for no other purpose. Where any materials equipment or system components are installed different from that shown on the Architect/Engineer's drawings, such differences shall be clearly and neatly shown on this set of drawings using ink or indelible pencil. At the completion of the project, the record set of drawings shall be turned over to the Architect/Engineer and shall become his property.

1.10 OPERATING INSTRUCTIONS:

The Contractor shall furnish the Owner two (2) sets of complete catalog data, manufacturer's literature and detailed manuals covering the operation and maintenance of all equipment specified under this Division. All such literature shall be bound in an amply sized three-ring binder and submitted to the Architect/Engineer for approval and for eventual transmittal to the Owner. The manual shall have a Table of Contents at the front of the manual.

The Contractor shall also supervise the initial operation of all equipment and instruct the operator selected by the Owner in such operation as required to acquaint him thoroughly with the equipment.

1.11 DELIVERY AND STORAGE OF MATERIALS:

Make provisions for delivery and safe storage of materials on the jobsite and make arrangements with other Contractors for introduction into the building of equipment too large to pass through

finished openings. Materials to be delivered at such stages of the work as will expedite the work as a whole and marked and stored in such a way as to be easily checked and inspected. All stored equipment shall be protected from the weather conditions and construction debris with a protective covering securely tied in place.

1.12 MECHANICAL PROVISIONS:

Mechanical equipment shall operate without objectionable noise or vibration, as determined by the Architect/Engineer. If such noise or vibration should be produced and transmitted to occupied portions of the building by apparatus, ducts, or other parts of the mechanical work, make necessary changes and additions, as approved, without extra cost to Owner.

Provide oil level gauges, grease cups and grease gun fittings for machinery bearings as recommended by the manufacturer. Extend oil or grease fittings by copper tubing to readily accessible locations.

1.13 COORDINATION OF WORK:

The Contractor shall process shop drawings and order equipment and materials expeditiously after receiving the Contract and the mechanical installation shall be substantially complete when the general construction work is completed. This Contractor shall confer and cooperate with all other Contractors on this project and shall arrange his work in proper relation to the work of others. Each Contractor shall furnish, install, and maintain in place all anchors, inserts, sleeves, etc., required for his work. Each Contractor will also be held solely responsible for proper size and location of all anchors, inserts, sleeves, chases, recesses, openings, bases, etc., required for proper installation of his work. All cutting and patching made necessary by failure or neglect to coordinate with other Contractors shall be the responsibility of this Contractor. Any cutting or patching shall be subject to the direction and approval of the Architect/Engineer and all damage due to cutting or patching shall be repaired by this Contractor.

After being instructed by this Contractor to do so, the General Contractor will leave all openings in roof, walls, floors, etc., for the passage of ducts, etc. The General Contractor shall also provide concrete bases and roof curbs where shown for mounting the mechanical equipment unless specified otherwise. This Contractor shall verify the exact size and location required for installation of his equipment with the General Contractor.

In general, the Division 26 – Electrical Contractor will provide all power wiring and make one power connection to each item of mechanical equipment, as outlined under Electrical Section.

1.14 GUARANTEE:

All mechanical equipment including equipment used during construction for temporary purposes shall be guaranteed for a period of one year after the time of final acceptance of this work and shall be in like new condition at time of final acceptance.

1.15 ELECTRICAL:

Electric Motors:

All electric motor driven equipment being furnished and installed under Division 23 of these specifications shall be complete with electric motors, unless specified otherwise.

All electric motors shall be as manufactured by Westinghouse, Century, Wagner, Allis Chalmers, Reliance, General Electric, or equal. Bearings shall be ball type with alemite lubricating fittings extended to an easily accessible location for field servicing. Minimum service factors for all motors shall be 1.15. All motors shall conform to applicable NEMA standards and all motors specified for use in hazardous locations shall bear the stamp of approval of the Underwriter's Laboratories. All motors, except direct connected motors, shall be furnished complete with cast iron or stamped steel adjustable slide rails. Single phase motors shall be capacitor start type, drip proof, unless specified otherwise. All motors shall be single speed and shall operate at 1,750 RPM, unless specified otherwise.

Horsepower Rating: All electric motors shall be sized to meet the horsepower requirements of the driven unit at design characteristics including all V-belt and/or drive and coupling losses which are incurred without loading the motor beyond its nameplate horsepower rating. Where V-belt drives are employed, the motor horsepower nameplate ratings shall not be less than 120 percent of the driven unit brake horsepower requirements.

Single Phase Motors: Unless specifically noted otherwise, all electric motors shall be designed for operation in an ambient temperature not exceeding 40 degrees C., continuous duty and shall be designed for use with voltage as scheduled on Drawings or specified, 60 cycle alternating current. Motors shall be thermally protected.

Three Phase Motors: All electric motors shall be designed for operating in an ambient temperature not exceeding 40 degrees C., continuous duty and shall be designed for use with voltage as scheduled on Drawings or specified, 60 cycle alternating current.

All motors less than 3/4 horsepower shall be 115 volt, single phase unless designated otherwise and all motors 3/4 horsepower and larger shall be as specified in the specific section or as noted on the Drawings.

Motors shall be designed with special stator steel for reduced core losses. Windings shall be oversized copper placed for maximum efficiency. Stator and rotor shall be extra long to reduce flux losses. Frame shall be ODP (unless specified otherwise) of cast iron or cast aluminum construction.

Motors shall be squirrel cage, horizontal base mount, ball bearing, NEMA B design, Class B design, Class B insulation, continuous duty, 1.15 SF, 40 degrees C. ambient.

Minimum nominal full load motor efficiencies shall be based on ASHRAE Standard 90 (latest edition).

Motors shall be similar to Louis Allis "Spartan" Series, Gould "E-Plus" Series, or Westinghouse "MAC II" Series. Manufacturer shall furnish proof of efficiency rating.

Motor Starters:

Except where specifically described as being furnished as a part of the equipment furnished and installed under Division 23 of these specifications, all motor starters will be furnished and installed under Division 26, ELECTRICAL.

Electrical Wiring:

Except where specifically described as being furnished as a part of the equipment furnished and installed under Division 23, all electric power wiring shall be furnished and installed in Division 26, ELECTRICAL. The Electrical Contractor will make one power connection to each item of mechanical equipment, unless specified otherwise.

Electrical wiring furnished and installed under these specifications shall conform to all applicable requirements of Division 26, ELECTRICAL.

Unless otherwise indicated, all motors and controls shall be furnished, set in place and wired in accordance with the following schedule:

Item	Division Furnished Under	Set in Place or Mounted Under	Division Wired & Connected Under
Equipment Motors	23	23	26
Magnetic Motor Starters:			
Automatically controlled, with or without HOA switches	26	26	26
Automatically controlled, with or without HOA switches and furnished as part of factory wired equipment	23	23	26
Manually controlled	26	26	26
Manually controlled and furnished as part of factory wired equipment	23	23	26
Line voltage thermostats, time clocks, etc., not connected to control panel			

systems	23	26	26
Electric thermostats, time clocks, remote bulb thermostats, float controls, etc., which are an integral part or directly attached to ducts, etc.	23	23	23
Temperature control panels and time switches mounted on temperature control panels	23	23	23
Damper motors, solenoid valves, EP and PE switches, etc.	23	23	23
Control circuit feeders	26	26	26
Low voltage controls, thermostats, valves, dampers, etc.	23	23	23
Pushbutton stations, pilot lights	26	26	26
Disconnect switches, thermal overload switches, manual operating switches	26	26	26
Contactors	26	26	26
Control relays, transformers	23	26	26

NOTES:

(1) Wiring from alarm contacts to alarm system shall be by the Division 26 Contractor; control function wiring shall be by the Division 23 Contractor.

All control wiring and controls as noted on the Drawings and/or as specified in these specifications shall be provided by this Contractor, including items set in place and wired and connected by the Division 26 Contractor, unless specifically shown otherwise on the Drawings.

1.16 EQUIPMENT SUPPORT:

Furnish and install all necessary wall backing, brackets, braces, plates, angles, wall hangers, etc., required for properly supporting mechanical equipment and mechanical appurtenances. All supports shall be securely anchored with lead inserts, expansion shields, through-going bolts, lag screws or other devices as required.

All items of mechanical equipment hung from overhead structure shall be hung from 2-1/2 inches by 2-1/2 inches by 3/16 inch angles minimum which shall span at least 3 members, unless noted otherwise.

1.17 EXISTING SERVICES:

The Contractor shall verify the exact location of all existing building services extended and/or relocated for this project. The Contractor shall also verify the exact location and take proper precautions to protect all services which may be encountered during construction.

All active services which are encountered shall be protected, braced and supported where required for proper execution of the work and without interruption of the service if possible.

All inactive services which are encountered shall be protected or removed as directed by the Architect/Engineer, Owner, Utility Company or Municipal Agency having jurisdiction. The service shall also be plugged or capped as directed.

When active services must be temporarily interrupted, the interruption shall be scheduled at night or at such time as approved by the Owner or authority having jurisdiction and so as to cause the minimum of interference with establishing operating routine. Arrangements shall be made to work continuously including overtime if required, to assure that services will be interrupted only as long as actually required to complete necessary work.

1.18 ACCESS TO EQUIPMENT:

Access shall be provided to all motors, valves, dampers, controls, specialties, etc., for maintenance purposes. All access doors, access panels, removable sections, etc., required for access shall be provided. The location of the access openings relative to the mechanical equipment shall be coordinated to assure proper access to the equipment. The door shall maintain any ratings of the wall, ceiling, etc. that it penetrates.

Access openings are required for valves, manual, motorized, fire, and smoke dampers and other devices requiring access and shall be provided in the ductwork, plenums, housings, tanks, walls, ceilings, etc., under this portion of the Contract.

END OF SECTION 230100

SECTION 230700 - INSULATION

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

Section 230100, General Provisions, in its entirety, including references to the General Construction Specifications are hereby adopted and made part of these specifications.

The work involved in this specification and the accompanying Drawings consists of performing all labor and furnishing of all labor, materials, fixtures, and equipment necessary to install complete piping, ductwork, and equipment insulation as described herein and/or as shown on the Drawings. This includes all equipment and materials obviously necessary for complete systems though not specifically mentioned or shown.

1.02 MATERIALS AND WORKMANSHIP:

All covering and insulating materials used on this project must contain the manufacturer's name on the containers. All materials must be dry and in good condition, free of defects, mildew, rough ends, etc. Insulation materials shall be Anco, Certainteed, Owens-Corning, Johns Manville, Armstrong, Knauf or equal.

All insulation work shall be performed by an Insulation Contractor who uses workers skilled in this type of work. Only first class workmanship will be acceptable. The Insulation Contractor shall submit shop drawings for all materials proposed to be installed in this project.

All pipe covering shall have a density of not less than 3-1/2 pounds per cubic foot.

All materials shall have composite fire and smoke hazard ratings as tested by procedures ASTM 84, NFPA 255, AND U.L. 723 not to exceed 25 Flame Spread and 50 Smoke Developed.

1.03 EQUIPMENT INSULATION:

Insulation shall be cut or mitered where necessary to fit the contour of the fittings and equipment. All voids shall be packed with light density glass fiber insulation. Insulation sections shall be banded in place with 3/4 inch x 0.015 inch thick galvanized steel bands at 18 inch o.c. for all large equipment. Insulation shall be covered with one inch galvanized hexagonal wire mesh. Apply 1/2 inch of insulating cement such as OC-110 or equal in 2 layers over the wire mesh.

On all cold systems, insulation shall be impaled over welding pins at 12 inches o.c. and secured in place with speed washers. The 3/4 inch steel bands will not be required. Each layer of insulation shall have a vapor barrier cover to provide complete airtight envelope. Vapor-barrier shall consist of one layer of Ludflow foil barrier paper smoothly adhered to the insulation cement surface with vapor-barrier lap adhesive. Lap all joints a minimum of 3 inch and seal with vapor-barrier lap adhesive.

1.04 DUCT INSULATION - EXTERNAL:

All outdoor air ductwork and combustion air ductwork shall be insulated with 1-1/2 inches of external insulation.

Insulate all drip pans and ducts through the roof or sidewalls with 1 inch of external insulation. All ducts through the roof or sidewalls shall be insulated for a minimum distance of 4'0" laterally from the opening. This shall apply to all relief and exhaust air openings.

External duct insulation in exposed locations shall be 3 pound density Owens-Corning Fiberglass FSK for cold equipment down to minus 60 degrees F., or equal. Insulation shall be cut to fit between standing seams and stiffeners and shall be secured to ductwork by impaling over pins located not more than 12 inches o.c. or more pins if necessary to provide a tight fit to the ductwork. All joints shall be tightly butted and taped. Cover all pin penetrations and all joints with OCF joint sealing tape or equal. Take special care in applying the tape to prevent dust from fouling the tape. The complete installation of external duct insulation shall follow the instructions of the manufacturer of the insulation used. Complete system shall be U.L. rated and meet NFPA Fire Hazard Classification.

External duct insulation in concealed locations shall be 1 pound density Owens-Corning Fiberglass Faced Duct Wrap Series ED 100 FRK-25, or equal. Insulation shall be wrapped tightly on the duct work with all circumferential joints butted and longitudinal joints overlapped a minimum of 2 inches. Adhere insulation to metal with 4 inch strips of insulation bonding adhesive at 8 inch o.c. Additionally secure insulation to the bottom of rectangular duct work over 24 inches wide with mechanical joints, the 2 inch flange of the facing shall be secured using 9/16 inch flare-door staples applied 6 inches o.c. and taped with minimum of 3 inch wide foil reinforced kraft tape. On longitudinal joints, the overlap shall be secured using 9/16 inch flare-door staples applied 6 inch o.c. and taped with minimum 3 inch wide foil reinforced kraft tape. All pin penetrations or punctures in facing shall also be taped.

Wrap duct at penetrations of fire or smoke barriers with firestop insulation, seal jacket seam and seal end joints to adjacent sections of insulation. Seal opening between insulation and sleeve with firestopping material.

END OF SECTION 230700

SECTION 230800 - VENTILATION AND AIR CONDITIONING

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

Section 220100 General Provisions, in its entirety, including references to the General Construction Specifications are hereby adopted and made part of these specifications.

The work involved in this specification and the accompanying Drawings consists of performing all labor and furnishing of all materials, fixtures and equipment necessary to install complete ventilation and air conditioning systems as described herein and/or as shown on the Drawings. This includes all ductwork, equipment, wiring and materials obviously necessary for complete systems though not specifically mentioned or shown.

1.02 DUCTWORK:

All ductwork is to be galvanized iron fabricated and erected in a workmanlike manner. Fabricate plenums and special fittings, as shown on the Drawings, or as required. Access doors to plenums shall be double wall construction with heavy hardware. All ductwork shall be of the gauges hereinafter specified and constructed to the best grade Inland, U.S. Steel, United Sheet Metal or equal brands, heavily galvanized.

Metal gauges for low pressure duct systems shall be of metal gauges and reinforcing as recommended by SMACNA or as follows:

Maximum Dimension of Rectangular Ducts or Diameter of Round Low Pressure Ducts	Galvanized Sheet Steel Gauge Number
Up thru 12"	26
Over 12" thru 30"	24
Over 30" thru 54"	22
Over 54" thru 84"	20
Over 84"	18

Ductwork shall be constructed, braced, reinforced and sealed as recommended by ASHRAE and SMACNA. Environmental air ductwork as defined by the International Mechanical Code shall be substantially air tight. Low pressure ductwork shall be suitable for pressures up to 2 inch w.g. All ductwork 18 inches and greater in width shall be cross-broken. See SMACNA requirements for proper sealing of ductwork.

Non-proprietary T-24, proprietary TDC/TDF flanges and Ductmate 35/25 may be used for transverse joint construction where the longest side is 35 inches or smaller. Ductwork with the longest side 36 inches and over shall be constructed using Ductmate 35/25 or equal slide on systems, per Ductmate Industries Installation Procedures and Duct Construction Standards, latest edition. Proprietary TDC/TDF flanges may be used for transverse joint construction where the longest side is 36 to 42 inches, if constructed to an additional 1 inch w. g. The non-proprietary SMACNA T-22 Flanged Connection may be used as defined on Page 1.63, 1.64 and 1.80, of the

1995 SMACNA Manual, Second Edition. Ductmate 440 Butyl Gasket, or equal, shall be used between all rectangular transverse flanged duct connections, Ductmate's 440 Butyl Gasket, shall be used with the Ductmate Systems. For rectangular ductwork located outdoors, exposed to weather, construct ductwork per, "Transverse Joints Rectangular" with a continuous metal cleat on top joints of ducts for added weather protection. Slide on systems shall be Ductmate, Ward Industries, Inc., or equal.

No obstruction shall be permitted in the ductwork to retard the flow of air. If it is necessary to run a pipe or conduit through a duct, the duct size shall be increased to compensate for the obstruction.

Where space permits, duct turns shall be constructed with an inside radius equal to or greater than the duct width or duct turn vanes may be used. Where space does not permit duct turns as described above, duct turn vanes shall be used. Where space permits, duct offsets 30 degrees and greater shall be constructed with an inside radius equal to or greater than the duct width.

Where interior duct insulation is required, increase the duct size to maintain the free area shown on the Drawings.

Provide exterior insulated drip pans, 3 inches deep, under or adjacent to all roof and wall openings including but not limited to under all intake or relief hoods and louvers. Drip pans to be soldered watertight.

Power operated dampers not furnished as a component of the ventilating machines will be furnished under the Temperature Control Specifications. They shall be installed in the ductwork under this specification. Caulk around all sides of high efficiency damper frames.

Flexible connections shall be installed between suction and discharge openings in fan units and the ducts with which they are connected as shown on the Drawings, to prevent transmission of vibration noises. Material shall be watertight and fire retardant canvas weighing not less than 20 ounces per square yard, or shall be glass fabric on high temperature systems where fire hazard exists. Both materials shall be approved by Underwriter's Laboratories. The flexible material shall be furnished with all necessary angles, bolts, clips or other fasteners.

Furnish and install access panels in the ductwork adjacent to all motorized dampers, fire dampers, louvers, reheat coils, and equipment which may require servicing or cleaning. Panels shall be tight fitting and shall be located so as to make them easily accessible. All panels installed in insulated ductwork shall be double wall, insulated type. Panels shall be Ruskin, Air Balance, Ventlok, ADCO, or equal.

Dynamic rated fire dampers shall have an 18 inch square access panel or an 18 inch long removable duct section shall be installed adjacent to dynamic rated fire dampers in addition to a smaller inspection access panel. The removable section shall be assembled using Ductmate or equal duct joints. The joint at the damper shall be assembled with plastic fastener clips. Ductwork 24 inches and wider shall have an 18 inch by 18 inch access door in lieu of removable section.

Ductwork installed above UL fire rated ceiling assemblies shall be installed in strict accordance with the provisions required by the UL Design Number designated in the Underwriters Laboratories Fire Resistance Directory.

All ductwork visible through the face of a register or grille shall be painted with a flat black paint.

All rigid and flexible ductwork materials installed shall have composite fire and smoke hazard ratings as tested by procedures ASTM 84, NFPA 255 and UL 723 not to exceed 25 Flame Spread and 50 Smoke Developed.

Concealed low pressure round ductwork may be rigid spiral ductwork or snaplock type with adjustable elbows.

All exposed round ductwork shall be United, Semco, Norlock, Foremost, SMC, SPOT or equal, rigid spiral duct and fittings. Tee fittings shall be factory built tee fittings or equal. Saddle branch takeoff fittings are not acceptable except as approved by the Architect/Engineer.

Round ductwork shall be supported at 6 feet o.c. where building framing does not provide such support. Support shall be minimum 3/4 inch metal strap suspended from the roof or framing.

Flexible duct shall not exceed 8 feet in length or pass through walls. Flexible round ductwork may only be used for final connections to supply registers and diffusers in concealed locations.

All round sheet metal supply air ductwork, except exposed, shall be insulated with 1 inch thick of Owens-Corning Fiberglass Faced Duct Wrap Series ED-100 FRK-25 or equal.

1.03 REGISTERS, GRILLES AND DIFFUSERS:

Furnish and install all registers, grilles and diffusers as specified hereinafter and as designated on the Drawings. Opposed blade, heavy duty dampers shall be used on systems having two or more duct openings where balancing of air discharge or intake is required. Grilles may be used where there is only one opening and where balancing is not required.

Diffusers, registers, and grilles shall be provided as listed in the schedule on the Drawings. All registers, grilles and diffusers shall be of size and capacity with special requirements, frames, dampers, blank-off baffles, etc., as listed in the schedule and as designated. Opposed blade, heavy duty dampers shall be provided on all units unless designated otherwise on the Drawings.

Louver faced ceiling diffusers shall have a minimum of three (3) inner diffuser cones plus the outer shell unless scheduled otherwise.

The installed location of all ceiling diffusers, registers, and grilles shall be as shown on the Reflected Ceiling Plans.

The finish on all aluminum registers, grilles and diffusers shall be etched to a lustrous satin finish and coated with a clear acrylic lacquer, or white finish as noted below and/or on the Drawings. All steel units shall have white enamel finish, unless noted otherwise. Interior of perforated diffusers shall be painted black.

All ceiling mounted registers, grilles and diffusers shall be white unless noted otherwise. All floor mounted registers, grilles and diffusers shall be satin anodized without mounting holes unless otherwise noted.

Ceiling registers, grilles and diffusers in fire rated ceilings shall have an outer cone of 24 gauge (minimum) steel construction and shall have UL Fire Resistance Classified fire dampers with radiation shields.

Registers, Grilles and Diffusers shall be Tuttle and Bailey, Carnes, Anemostat, Titus, J & J Register, Metal Industries, Grillmaster, Krueger, Price, Reliable, Nailor or equal.

1.04 SQUARE CENTRIFUGAL IN-LINE FAN:

Square Centrifugal In-Line Fans shall be centrifugal direct driven in-line type. The fan housing shall be constructed of heavy gauge galvanized steel and shall include duct mounting collars.

Fan construction shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.

The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.

Motors shall be heavy duty ball bearing type, carefully matched to the fan load and furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted out of the airstream. Motors shall be readily accessible for maintenance.

Factory wiring shall be provided from motor to the handy box.

All fans shall bear the AMCA Certified Ratings Seal for both sound and air performance.

Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

Square Centrifugal In-Line Fans shall be Carnes, Greenheck, Twin City Fan, Aerovent, S&P, or equal.

1.05 GAS VENT AND FLUE PIPING:

Gas vent piping from a point 2'-0" below ceilings shall be Metalbestos RV, Type "B" double wall gas vent piping or equal, Underwriter's Laboratories approved, gas vent pipe in sizes shown on the Drawings. Vent shall be extended a minimum of 24 inches above the roof, or as indicated on the Drawings. Furnish and install round birdproof tops, storm collar, flashing cone and accessories as necessary for an approved installation.

Gas vent piping 10 inches and larger, when required, shall be Metalbestos QC, Type "B", vent pipe, otherwise similar to above.

Flue piping shown between appliances and gas vent pipe shall be standard weight galvanized steel with standard fittings tightly fitted and properly pitched. Maintain 1 inch clearance (minimum) to combustibles.

Gas Vent Piping shall be Metalbestos, Stacks Inc., Metal-Fab, Van Packer, AMPCO-Amerivent or equal.

1.06 AUTOMATIC TEMPERATURE CONTROL:

Install the automatic temperature control dampers, air flow monitoring devices, openings for air flow switches, alarms and control devices as provided by the Automatic Temperature Control Contractor.

These dampers and devices shall be installed under the direct supervision of the Section 230900, AUTOMATIC TEMPERATURE CONTROL Contractor and in strict accordance with the manufacturer's recommendations.

Caulk around all sides of high efficiency damper frames.

1.07 TESTS:

General:

The Contractor shall furnish a competent individual familiar with the installation to assist the Balancing Company and make the necessary mechanical equipment adjustment as directed by the Balancing Company. The Contractor shall also furnish the necessary ladders, scaffolding, etc., needed for access to test and balance all systems.

The Contractor shall provide replacement pulleys, etc. as required to properly balance the ventilation equipment.

The following tests shall be performed on the respective systems. Tests shall be repeated until each system is proven acceptable.

Heating and Cooling:

The Contractor shall employ an independent testing and balancing company to properly balance the water flow to and from all coils and equipment and make any adjustments necessary in balance valves, etc., to meet the required flows.

The Contractor shall furnish to the Architect/Engineer one electronic typewritten copy of tabulations of the water flows. This tabulation shall include unit number, room number, gpm for all connections, showing both design gpm and actual gpm. The Contractor shall tabulate all pump pressure differentials, gpm and pump motor current and voltage readings taken after all terminals and equipment have been balanced. List the bypass gpm on 3-way valves. The Contractor shall operate the controls (thermostat, etc.) to verify that the gpm changes from no flow to design flow and shall designate the results in the report.

Ventilation and Air Conditioning:

The Contractor shall make thorough tests of the following systems.

Air Systems:

The Contractor shall make a thorough test of all air systems. He shall employ an independent testing and balancing company to properly balance the air flow to and from all openings and make any adjustments necessary in fan speeds, etc., to meet the required air volume.

The Contractor shall furnish to the Architect/Engineer one electronic typewritten copy of tabulations of the air volumes. This tabulation shall include unit number, room number, supply,

return, or exhaust CFM's for all openings, showing both required CFM and calculated CFM, grille size. The Contractor shall also submit a tabulation of all fan RPM's, static pressure, CFM's and fan motor current and voltage readings taken after the terminals have been balanced.

Independent Testing and Balancing Company:

Testing and balancing work shall be executed under the direct supervision of a registered professional engineer having an experience record of not less than five (5) years in the mechanical contracting industry, engaged in testing, balancing and adjusting of air and hydronic mechanical systems for not less than two (2) years of that time; or, under the direct supervision of a qualified testing, adjusting and balancing supervisor, possessing certification from the National Environmental Balancing Bureau (NEBB). Testing and balancing work shall not be done by the installing contractor.

Comply with the applicable procedures in the chapter on Testing, Adjusting and Balancing in the latest ASHRAE Edition of the Systems Handbook.

Calibration and maintenance of instruments shall be in accordance with manufacturer's standards and recommendations, and calibration histories for each instrument shall be available for examination.

Accuracy of measurements shall be in accordance with the applicable measurement means as listed in the chapter on Measurement and Instruments in the latest edition of ASHRAE Fundamentals Handbook.

Allowable Tolerances:

Tolerances of adjustment for air handling systems are plus or minus 5% for supply systems and plus or minus 10% for return and exhaust systems from figures shown on the Drawings.

Tolerances of adjustment for hydronic systems, are plus or minus 10% of design conditions shown on the Drawings.

Rebalancing and adjustments found necessary to maintain and to achieve satisfactory operating conditions during the contract guarantee period shall be performed by the Testing and Balancing Subcontractor.

Acceptable Testing and Balancing Companies meeting the above requirements are as follows:

Balancing Professionals, Inc.
Precision Test and Balance
ReCom, Inc.
Systems Management and Balancing, Inc.
Tab, Inc.

Independent testing and balancing companies not listed above must submit for approval prior to the Bid.

END OF SECTION 230800

SECTION 230900 - AUTOMATIC TEMPERATURE CONTROL

1.01 SCOPE:

The GENERAL, SUPPLEMENTAL and other CONDITIONS of the Contract and the GENERAL REQUIREMENTS (Division 1) are hereby made part of this Section.

Section 230100, General Provisions, in its entirety, including references to the General Construction Specifications, are hereby adopted and made part of these Specifications

The work involved in this specification and the accompanying drawings consists of performing all labor and furnishing of all materials, fixtures and equipment necessary to install complete automatic temperature control systems, as described herein and/or shown on the Drawings. This includes all piping, wiring and materials obviously necessary for complete systems though not specifically mentioned or shown.

Furnish and install an Automatic Temperature Control/Building Automation System (ATC/BAS) as manufactured by Siemens Apogee, G&R Controls. The controls shall be an extension of the existing system.

ATC components shall be the manufacturer's latest standard design that complies with the specification requirements and in conformance with the following applicable standards for products specified:

A. American Society for testing and materials, ASTM
B. Institute of Electrical and Electronic Engineers, IEEE
C. National Electrical Manufacturers Association, NEMA
D. Underwriters Laboratory, UL (UL 916)
E. FCC Regulation, Part 15, Section 156
F. National Fire Protection Association, NFPA
G. Local building codes

1.02 WORKMANSHIP:

Installation workmanship must be the highest quality.

Panels must be amply sized to allow all components to be permanently mounted with ample space for wiring between components and around the panel perimeter. Groups and bundles of control wiring shall be in a gutter system with a removable cover.

Control wiring shall be cut with spare length at both ends to allow for connections at both ends with ample wire length and no splices adjacent to the connection. Control wiring shall not be spliced inside control panels. All wiring shall terminate on labeled terminal blocks or device mounted terminals under screws. All wires terminating under a common screw should be the same wire gauge or diameter.

All components must be permanently fastened inside control panels. Components shall be permanently labeled for the systems they serve and their function.

Control wiring must be routed parallel along and perpendicular to structural members.

Control wiring must be routed utilizing the cable tray system where cable tray systems are available.

Control wiring shall be installed in conduit in exposed locations, i.e., Mechanical Rooms and areas with exposed structure (no ceiling). Final connections to control components (valve actuators, damper actuators, etc.) must be by flexible conduit from a J-box set adjacent to the control component.
Control conduit ends must have insulated throats.

1.03 SUBMITTALS:

The ATC/BAS Contractor shall provide an equipment submittal that includes manufacturers' catalog data describing each item of control equipment or component to be provided and installed on the project.

The Contractor shall submit CAD generated schematic drawings for the entire control system for review and approval before beginning installation of the control system. Included in the submittal drawings shall be a one page diagram depicting the system architecture complete with a communications riser. Drawings shall include point-to-point wiring diagrams and must show: all controls, start-stop arrangement
for each piece of equipment, equipment interlocks, wiring terminal numbers and any special connection
information required for properly controlling the mechanical equipment. The submittal shall include a bill of material reference list as well as equipment sequences of operation.

1.04 ELECTRICAL INSTALLATION:

The ATC Manufacturer shall be responsible for installation of all of the control wiring to provide for a complete operating system. This electrical wiring shall include but not be limited to the following:

A. The term "control wiring" is defined to include the providing of wire, conduit, and miscellaneous materials as required for the mounting and connecting of electric or electronic control devices.

Control wiring includes but is not limited to the line and low voltage communications and power wiring necessary for the proper operation of the controllers as described herein. Control wiring shall be grouped and tied together along building lines parallel with and perpendicular to structural members. Control wiring shall be routed in the cable tray system when such a system is provided by Division 26 - Electrical.

B. All exposed wiring, low and line voltage, shall be run in conduit. Line and low voltage wiring shall be run in separate conduits. Concealed but accessible wiring, except in mechanical rooms and areas where other conduit and piping are exposed shall run in UL plenum rated cable as approved by local codes unless expressly restricted by requirements in the Division 16 specification. Plenum cable shall be installed high enough to provide adequate clearance for ceiling tile removal.

C. All power wiring shall be run by the Contractor from circuit breakers provided by the Division 16 electrician to the respective controller (s).

D. All wiring shall be installed in accordance with local and national codes as defined in the Division

26 specifications.

E. Numbered or color-coded conductors shall be used to allow for future identification and servicing of the control system.

F. All wall mounted sensors/thermostats shall be roughed in using a standard electrical box with conduit in the wall extended to the accessible ceiling area. They shall be mounted in accordance with and at a height to comply with The American's With Disabilities Act (ADA), unless noted otherwise on the Drawings. Mounting sensors with anchors or toggle bolts is not permitted.

1.05 INSTALLATION OF CONTROL VALVES, DAMPERS AND DEVICES:

All automatic control valves, water monitoring devices, flow switches, alarms and control devices shall be furnished by the ATC supplier and installed under his direct supervision by the Division 22 Contractor as noted in Section 220600 – HEATING.

All automatic control dampers, air flow monitoring devices, flow switches, alarms and control devices shall be furnished by the ATC supplier and installed under his supervision by the Division 23 Contractor as noted in Section 230800 – VENTILATION AND AIR CONDITIONING.

Furnish and install all switches, relays, contactors, etc. required for a complete operating system as specified in the Sequence of Operation.

1.06 PACKAGED UNIT REMOTE CONTROL PANELS:

Remote control panels furnished by the heating ventilation and air conditioning equipment manufacturers shall be wired and tested by this Contractor. Remote control panels furnished by the heating ventilation and air conditioning manufacturers shall be mounted respectively under Section 22600 and Section 23800 of these Specifications.

1.07 PRODUCTS:

Temperature Sensors:

Temperature sensors shall be linear precision elements with ranges appropriate for application, accurate within 1^{o}F over normal operating range.

Thermowells for all immersion sensors shall be stainless steel or brass as required for application.

Differential Pressure Sensor:

The differential pressure sensor shall have an accuracy of +/-2% of range.

Occupancy Sensor:

Occupancy sensor shall be of the passive infrared or ultrasonic receiver type. As a minimum the occupancy sensor shall provide adjustments for timed-on delay and sensor sensitivity.

Differential Pressure Switches:

Pressure differential switches shall have SPDT change-over contact, switching at an adjustable

differential pressure setpoint. Repeatability shall be better then +/-.02" H_2O.

Current Sensing Relays:

Current sensing relays shall have setpoint adjust, trip indication and five year unconditional warranty.

Flow Switches:

Flow switches shall be of the paddle type equipped with SPDT contacts to establish proof of flow. Flow switches shall be of the vapor-proof type.

Local Controls Panels:

All relays, switches, transducers and other field interface devices, for equipment located within the mechanical equipment rooms, shall be panel mounted. All electrical devices within the panels shall be wired to a numbered terminal strip. All wiring within the panel shall be run in accordance with NEMA and UL standards, and shall meet all local codes. Panels shall be NEMA type suitable for applications as required. Each panel shall have a final as-built control drawing, reduced, laminated and mounted inside of the panel door.

Control Labels:

All temperature control devices in the Mechanical Rooms shall be provided with plastic laminate nameplates indicating their purpose in operation fastened with screws or rivots. Embossed/printed tape labels are not acceptable. This shall include all thermometers, switches, gauges, etc., mounted in the face of the control panels, all control devices mounted inside the control panels, and all miscellaneous control devices mounted remote from the control panels.

Each control panel shall be properly identified to indicate the system or systems which it serves. The corresponding equipment shall also be similarly identified.

Miscellaneous:

The ATC Contractor shall furnish all electric relays. All electric control devices shall be of a type to meet current, voltage, and switching requirement of their particular application. Relays shall be provided with 24 VAC coils and contacts shall be rated at 10 amps minimum.

1.08 SEQUENCE OF OPERATION:

General:

All setpoints shall be adjustable. Deadband settings shall be used where appropriate to minimize cycling of equipment. Minimum on/off times shall be used where appropriate to minimize cycling of equipment.

Boiler and primary pump, (B-1, P-B1):

Whenever the outdoor air temperature is below 50 deg. F (adj.) or there is a call for heating, the boiler control sequence will be enabled. The packaged boiler controls shall start the primary hot water circulating pump and, the boiler burner will be energized. Enable the boiler and cycle the burner to low and high fire as required to maintain the secondary supply

temperature set point. The BAS shall reset the secondary heating loop HWS temperature according to the outdoor air temperature reset schedule. The reset schedule shall be fully adjustable from the operator's workstation

If the Boiler LWT falls below set point or the system hot water supply temperature is more than 10 degrees F. (adj.) lower than the BAS reset schedule is calling for, an alarm shall be initiated at the BAS.

The BAS Contractor shall provide a hand-off-auto switch for automatic or manual control of the boiler. When the switch is in the automatic position, they shall operate as described above.

The bas shall tie into the packaged boiler controls for the following: Generic boiler fault alarm, low fire, high fire, Enable/disable the boiler.

The secondary heating loop HWS temperature set point shall be reset in an inverse ratio with outdoor air from 160 F to 180 F as the outdoor air temperature ranges from 50F to -10F. All 4 points of the reset ramps shall be adjustable. When the burner is commanded to low fire and the load is such that the water temperature to rise above set point, the DDC controller shall cycle the burner off.

Provide temperature sensors at the boiler for boiler EWT and LWT with remote temperature indication at the operator’s workstation. The existing secondary heating loop hot water supply and hot water return temperature sensors shall be used.

Disable the boiler if the combustion air fan fails.

Water Heaters (two units):

Disable the water heaters if the combustion air fan fails.

Combustion air supply fan and motorized dampers for Boiler and Water Heaters:

The fan provides a constant airflow of mixed return and combustion air. The intent is to temper the combustion air with warm return air from the boiler room to prevent extremely cold air being distributed to the room.

Start the fan whenever a water heater or boiler fires.
When 1 or 2 water heaters fire and the boiler does not fire, position the outside air damper and return damper to provide 150 CFM outside air (as determined by balancing)
When 1 or 2 water heaters fire and/or the boiler fires, position the outside air damper and return damper to provide 750 CFM outside air (as determined by balancing)
When no equipment is firing, close the outside air damper and turn off the fan.
Provide a current switch on the fan to prove fan operation. If the fan does not prove operation, initiate an alarm at the user interface and dialer, and disable the boiler and water heaters from firing.

The intent is to reuse the existing motorized combustion air damper and to provide a new motorized return air damper.

Hot Water Unit Heater

The BAS shall maintain the desired space temperature through a DDC controller by cycling the unit fan and two position, two way control valve upon a call for heat in the space. The BAS shall prevent the fan from operating unless 120 degree F. (adj.) hot water is available. The DDC controllers shall be networked into the BAS to allow for remote adjustments, remote monitoring, and remote temperature indication at the operator's workstation, the DDC controllers shall be Application Specific Controllers (ASC).

Hot Water Heating Pumps:

The existing control sequence shall be used for the secondary heating pumps.

END OF SECTION 230900