BENTON COUNTY ARKANSAS

REPLACEMENT OF HEATING WATER BOILERS

Benton County Jail Facility
Bentonville, Arkansas

SPECIFICATIONS MANUAL

JUNE 1, 2018

GA ENGINEERS, INC.
2941 S. College Dr., Fayetteville, AR 72701 | Phone (479) 601-3331 | ga@gaengr.com

BENTON COUNTY JAIL
HEATING WATER BOILERS REPLACEMENT

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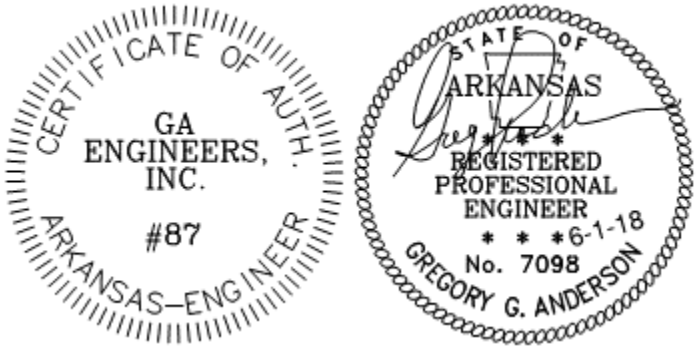


BENTON COUNTY JAIL
HEATING WATER BOILERS REPLACEMENT

BID SOLICITATION
DOCUMENT 00100

1.01 Sealed bids for The Replacement of the Heating Water Boilers at the Benton County, Arkansas Jail Facility, 1300 SW 14th Street, Bentonville, Arkansas, will be received from qualified bidders at the Benton County Administration Building, third floor Quorum Court Room, 215 E. Central Avenue, Bentonville, Arkansas until 2:00 PM, prevailing time, Tuesday June 19, 2018. Bids received after this time will not be accepted. Apparent low bidders will be notified within twenty-four (24) hours, followed by notification of results to other bidders.

The Owner:	Benton County, 215 E. Central, Bentonville, Arkansas 72712
The Engineer:	GA Engineers, Inc., 2941 S. College Drive, Fayetteville, Arkansas 72701. Mr. Greg Anderson, P.E. 479-601-3331

The scope of work includes: All materials, labor and all other associated work required to replace the existing domestic water heating unit in strict accordance with the bid documents.

Bidding documents will be made available via email for self printing by all bidders

Bids will be binding for a period of sixty (60) calendar days from the date bids are opened. All bids are to be accompanied with a bid bond or certified check payable to Benton County Arkansas of not less than five percent (5%) of the base bid. All bids are required to be submitted on the bid form provided in the bid documents. Bidders attention is directed to the requirements of the construction schedule, which is a part of the bidding documents. All bids must comply with the laws of the State of Arkansas. The Arkansas Department of Labor Prevailing Wage Rates will apply. Bids shall be submitted in a sealed, opaque envelope bearing the name and address of the bidder, bidders' license number, and marked: "Proposal for Replacement of Heating Water Boilers, Benton County Jail, Benton County, Bentonville, Arkansas."

Bidders are encouraged to attend a walk through prior to bidding on Wednesday, June 13 at 1:00 pm.

BENTON COUNTY encourages participation by minority businesses to submit bids for this construction project. BENTON COUNTY shall award public contracts without regard to race, religion, color, creed, national origin, sex, age or handicapping condition.

The successful bidder will be required to provide a performance and payment bond in the amount of one hundred percent of the contract price from an approved surety company holding a permit from the State of Arkansas to act as surety, or other surety or sureties acceptable to the Owner.

THE OWNER RESERVES THE RIGHT TO REJECT ANY AND ALL BIDS AND TO AWARD THE CONTRACTS IN THE BEST INTEREST OF THE OWNER.

Benton County
Bentonville, Arkansas

Benton County Judge

5/30/18
Date

END OF DOCUMENT 00100

BENTON COUNTY JAIL
HEATING WATER BOILERS REPLACEMENT

INSTRUCTIONS TO BIDDERS
DOCUMENT 00200

PART 1 - GENERAL

1.01 DESCRIPTION OF BID

A. BASE BID: Work includes General Construction, Mechanical and Electrical Work to replace the heating water boilers, as shown on the Drawing Sheet M1 and as described herein. One bid will be taken for all general construction with the mechanical work and electrical work alone. Itemized bids for the project will be listed on the bid form.

B. SCOPE OF WORK: This is a replacement of the two existing original boilers with two new boilers as shown on the plan sheet. The work will include all work necessary to replace the unit and put it in to complete operation. Provide all necessary related work and any other items or systems that must be removed or disconnected and replaced to accomplish the replacement of the boilers. Disconnect and reconnect the power wiring and provide any required additional circuits. Disconnect and reconnect and reprogram the existing building automation/automatic temperature control system. After completion of the system and making the new units completely operational, provide reprogramming of the setpoints for the new units per the Engineer's instructions. Provide complete testing of all aspects of the new units to verify complete and proper operation.

C. WORK RESPONSIBILITY: The mechanical contractor is responsible for all general construction, low voltage wiring, piping, plumbing, construction schedules, coordination between all contractors (electrical, plumbing, sheet metal, roofing, etc. as required), demolition, removal and disposal of existing equipment, new equipment check-out and start up, disposal of all equipment and trash, and recovery of the refrigerant of the existing equipment per EPA regulations. The mechanical contractor will be paid directly by the Owner.
The electrical contractor's work schedule and sequencing will be determined by the mechanical contractor. The electrical contractor and any other sub-contractors will be paid by the mechanical contractor.

D. BID FORM: The contractor shall submit the bid on the bid form provided herein.

1.02 EXAMINATION OF PREMISES

A. Before submitting his quotation, Contractor will be held to have examined the premises and satisfied himself as to existing conditions under which he will be obligated to operate, or that will in any manner affect Work under this contract. Site examinations may be coordinated with Bryan Beeson of the Benton County staff at (479)270-8626.

B. Bidder must inform himself fully of conditions relating to construction of project and employment of labor. Failure to do so does not relieve successful bidder of his obligation to furnish material and labor necessary to carry out provisions of his contract. Insofar as possible Contractor, in carrying out his Work, must employ such methods or means to avoid any interruption of or interference with Work of any other Contract. The physical removal and replacement of the unit will have to be done in a way that will limit down time to 6 hours per day and with 1 week's notice to the owner.

1.03 CONTRACTOR'S LICENSE

A. Parties quoting on this Work must comply with all requirements and regulations of Contractor's

License Law of the State of Arkansas, as set forth in Ark. Code Ann. 17-25-101 et. seq.

1.04 BID FORMS

A. Bids must be submitted on forms included in Document 00400 of Project Manual. Submit one copy.

B. Place Bid Documents in a sealed envelope and clearly labeled per the bid solicitation.

C. All taxes, fees, permits, fines, materials, labor, and any costs associated with the project will be included in the contractor's bid.

D. In case of discrepancy between written amounts shown by bidder and amounts in numerical figures on bid form, the amount written out rather than amount in numerical figures shall govern.

1.05 INTERPRETATIONS

A. No interpretation of plans, specifications or other bid documents will be made orally to any bidder. Requests for interpretation or clarification of Bid Documents must be made in writing addressed to the Engineer. **TO BE GIVEN CONSIDERATION, REQUESTS FOR INTERPRETATION MUST BE RECEIVED AT LEAST THREE (3) WORKING DAYS PRIOR TO DATE FIXED FOR OPENING OF BIDS.**

B. Interpretations and supplemental information will be issued in the form of written addenda mailed to prospective prime contract bidders. **ADDENDA WILL NOT BE ISSUED WITHIN TWO DAYS PRIOR TO DATE FIXED FOR OPENING OF BIDS.** Failure of bidder to receive any addendum shall not relieve bidder from obligation under his bid as submitted. All addenda so issued shall become part of Contract Documents.

C. Should an error, inconsistency or omission be found in the Bid Documents after the Bid Opening, the Contractor will be deemed to have prepared his bid based upon the more costly way of performing the Work.

D. Anything mentioned in the Specifications and not shown on the Drawings or shown on the Drawings and not mentioned in the Specifications is to have the same effect as if shown or mentioned in both.

1.06 BID GUARANTY

A. Bid must be accompanied by bid guaranty of not less than five percent (5%) of the amount of bid, and at option of bidder may be certified check, bank draft, or bid bond secured by Surety Company. Certified check or bank draft must be made payable to order of Owner. Bid guaranty shall insure execution of contract and furnishing of performance and payment bond or bonds by successful bidder.

1.07 OPENING OF BIDS

A. At time and place fixed for opening of bids, every bid received within time fixed for receiving bids will be opened, unless the bid contains irregularities in statutory requirements. Failure of bidder to respond to statutory requirements listed on the bid form may result in the bid being declared nonresponsive and the bid will not be evaluated nor will the bid be considered for the purposes of awarding a Contract.

1.08 WITHDRAWAL OF BIDS PRIOR TO BID OPENING

A. Bids may be withdrawn on written or telegraphic request dispatched by bidder in time for delivery in normal course of business prior to time fixed for opening; provided, that written confirmation of any telegraphic withdrawal over signature of bidder is placed in the mail and postmarked prior to time set for bid opening. Negligence on the part of bidder in preparing his bid confers no right of withdrawal or modification of his bid after such bid has been opened.

1.09 QUALIFICATIONS OF BIDDER

A. Owner may make such investigations as he deems necessary to determine ability of bidder to perform Work, and bidder shall furnish to Owner all such information and data for this purpose Owner may request. Owner reserves right to reject bid of any bidder who has previously failed to perform properly, or to complete on time, contracts of similar nature; who is not in position to perform contract, or who has habitually and without just cause neglected payment of bills or otherwise disregarded obligations to subcontractors, material men, or employees.

1.10 POWER OF ATTORNEY

A. Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

1.11 LAWS AND REGULATIONS

A. Bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and rules and regulations of authorities having jurisdiction over construction of project shall apply to contract throughout, and they will be deemed to be included in contract the same as though written out in full.

1.12 BID FORMALITIES AND REJECTION OF BIDS

A. Owner reserves right to waive any formalities in a bid or to reject any or all bids.

1.13 CONDITIONAL BIDS

A. Conditional bids will not be considered.

1.14 "CALL BEFORE YOU DIG" STATE LAW

A. An Arkansas State Law passed by the 1991 Legislative Session requires that at least two days advance notice be given by calling 1-800-482-8998 before digging on a construction project using mechanized equipment. This is a free service. Failure to do so can result in a penalty ranging up to the amount of $10,000.

1.15 CONTRACT TIME

A. It is the desire of the owner to have the new unit installed and operational as soon as is reasonably possible. Contractor shall exercise all reasonable methods to accomplish the quickest reasonable completion of this project.
B. Contractor shall submit the units and accessories submittal immediately upon contract award and shall order the unit immediately upon receipt of submittal approval.
C. Contractor shall complete installation of the unit as soon as possible but no later than 10 days after delivery of the unit.
D. Owner will pay the Contractor within 30 days after pay application. Pay application shall be after completion of installation of the unit.

END OF DOCUMENT 00200

BENTON COUNTY JAIL
HEATING WATER BOILERS REPLACEMENT

BID FORM
DOCUMENT 00400

BENTON COUNTY JAIL
HEATING WATER BOILERS REPLACEMENT
PROJECT NO. 17021
BENTONVILLE, ARKANSAS

Proposal of _____
(hereinafter called "Bidder"): (Strike Out Following Inapplicable Items)

1. An _____ Corporation,
   (State)
2. A Partnership, or

3. An Individual doing business as _____

_____

To: Benton County Arkansas

Bidder, in compliance with bid solicitation for construction of Heating Water Boilers Replacement for the Benton County Jail Building, having examined plans and specifications with related documents and site of the proposed Work, and being familiar with all conditions surrounding proposed project, including availability of materials and labor, hereby proposes to furnish labor, materials, and supplies, and construct project in accordance with Contract Documents, within time set forth therein, and at prices stated below. Prices are to cover all expenses incurred in performing Work required under Contract Documents, of which this proposal is a part.

Bidder hereby agrees to commence work under this contract on or before date specified in written "Notice to Proceed" and fully complete project within time stipulated in specifications.

Bidder acknowledges receipt of the following addenda:

No.___ Date:_____ No.___ Date:_____ No.___ Date:

No.___ Date:_____ No.___ Date:_____ No.___ Date:

BENTON COUNTY JAIL
HEATING WATER BOILERS REPLACEMENT

PROPOSAL:

CONTRACTOR BID PRICE

$_____ (_____

_____)

LIST OF SUBCONTRACTORS

I, the undersigned Contractor, certify that proposals from the following subcontractors were used in the preparation of my proposal. I agree that if I am the successful bidder, and if following subcontractors are approved, I will not enter into contracts with others for these divisions of the Work without written approval from Engineer and Owner.

NAME: AR LICENSE NO.

PLUMBING:_____

ELECTRICAL:_____

LIST OF EQUIPMENT MANUFACTURERS

I, the undersigned Contractor, certify that proposals from the following manufacturers of equipment were used in the preparation of my proposal. I agree that if I am the successful bidder, and if following manufacturers are approved, I will not enter into contracts with others for these divisions of the Work without written approval from Engineer and Owner.

NAME:

BOILER EQUIPMENT MANUFACTURER:_____

Bidder understands that Owner reserves right to reject any or all bids and to waive any informalities in the bidding. Bidder agrees bid shall be good and may not be withdrawn for period of sixty (60) days after scheduled closing time for receiving bids.
Upon receipt of written notice of acceptance of bid, Bidder will execute formal contract within ten (10) days and deliver Surety Bond or Bonds as required by Document 00600. Bid security attached in amount of 5% of base bid is to become property of Owner in event above contract and bond are not executed within time set forth above.

Date:_____ By:_____
(Signature)

Ark. License No._____
(Title)

_____
(Business Address)

_____

(Seal – If bid is by a Corporation)

END OF DOCUMENT 00400

BENTON COUNTY JAIL
HEATING WATER BOILERS REPLACEMENT

BONDS
DOCUMENT 00600

PART 1 - GENERAL

1.01 CONTRACTOR'S GUARANTY BOND

A. Contractor shall furnish "Performance and Payment Bond" in amount equal to 100% of contract price, as security for faithful performance of this contract and for payment of all indebtedness for labor and materials furnished or performed in connection with this contract. Bond shall be written by surety company which has qualified and is authorized to do business in the State of Arkansas and must be executed by a resident or nonresident agent who is licensed by the Insurance Commissioner to represent surety company executing said bond and filing with said bond, his power of attorney as his authority. Mere countersigning of a bond will not be sufficient. Bond shall be written in favor of Benton County Arkansas, and executed pursuant to terms of Ark. Code Ann. 18-44-501 et. seq. An original and two copies of bond must be furnished, with power of attorney attached to each. Bond must not be dated prior to date of the contract. Contractor shall file (not record) the original with the Clerk in the Circuit Court of the County in which Work to be performed is located. Contractor to pay all expenses incident the filing of bond. Remaining two copies should be certified by the Clerk to evidence filing of original, and these two copies submitted to the Engineer.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF DOCUMENT 00600

BENTON COUNTY JAIL
HEATING WATER BOILERS REPLACEMENT

GENERAL CONDITIONS
DOCUMENT 00700

PART 1 - GENERAL

1.01 AUTHORITY

A. General Conditions and Supplementary Conditions are an integral part of all sections of Project Manual. Their contents and provisions shall be carefully noted in performance of Work.

1.02 SCOPE OF WORK

A. The work included under these Specifications consists of furnishing all items, materials, operations, or methods listed, mentioned, indicated, or scheduled on the drawings and/or in these Specifications, including all labor, materials, equipment, transportation, temporary facilities, services and incidental necessary and required for the construction and completion of the project named in the title page in accordance with contract documents.

1.03 FORM OF SPECIFICATIONS

A. General Conditions and Division 1 (General Requirements) apply to every Division (1 through 33 of these Specifications.

B. These Specifications are of abbreviated form and contain incomplete sentences. Omissions of words or phrases such as "the Contractor shall" "shall be", "as noted on the drawings", "according to the drawings", "a", "an", "the", and "all" are intentional. Omitted words and phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the drawings.

C. All specification instructions are directed to the Contractor and the inclusion of any work by mention, note, or itemization, however brief, implies the Contractor shall provide same, unless specifically directed otherwise. Where a specific Contractor is named, he shall be responsible for and provide work so designated.

D. In specifying an item by manufacturer's name and/or catalog number, such item is to be provided complete with all the standard devices and accessories as indicated in the latest edition of the manufacturer's catalog or brochure published at date of invitation to submit proposal, unless specifically stated otherwise.

1.04 GOVERNING STANDARD DOCUMENT

A. "General Conditions of the Contract for Construction", Document No. A201-207 of American Institute of Architects, Articles 1 through 15 inclusive, consisting of thirty seven (37) printed pages, is hereby bound and incorporated into these specifications and is to be used as the General Conditions for this contract.

1.05 AMENDED PROVISIONS

A. Where any article or articles of above A.I.A. General Conditions are supplemented by Supplementary Conditions, provisions of such articles shall remain in effect and supplementary provisions shall be considered as added thereto. Where any such article or part of such article is

amended, voided or changed by Supplementary Conditions, provisions not specifically so amended, voided or changed shall remain in full effect. Where provisions of Supplementary Conditions are at variance or conflict with provisions of the A.I.A. General Conditions, Supplementary Conditions shall govern. A.I.A. General Conditions and Supplementary Conditions apply to all Work in every Division or Section of these Specifications.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF DOCUMENT 00700

BENTON COUNTY JAIL
HEATING WATER BOILERS REPLACEMENT

SUPPLEMENTARY GENERAL CONDITIONS
DOCUMENT 00800

PART 1 - GENERAL

1.01 REFERENCE DOCUMENT

A. These Supplementary Conditions are included as a part of the contract documents for this project to amend the provisions of the "General Conditions of the Contract for Construction", Document A201-2007 of the American Institute of Engineers, as required for this project. References herein to articles of the General Conditions refer to said Document A201.

1.02 PARAGRAPH 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

A. Add subparagraph 3.3.4 as follows:

"3.3.4 Contractor (1) shall review any specified construction or installation procedure (including those recommended by manufacturers); (2) shall advise the Engineer (a) if the specified procedure deviates from good construction practice, (b) if following the procedure will affect any warranties, including the Contractor's general warranty, or (c) of any objections the contractor may have to the procedure; and (3) to propose any alternative procedure which the Contractor will warrant."

1.03 PARAGRAPH 3.4 LABOR AND MATERIALS

A. Add Subparagraph 3.4.4 as follows:

"3.4.4 All contractors and subcontractors engaged in the Owner/Contractor Agreement shall conform to the labor laws of the State in which Work is to be performed and the various acts amendatory and supplementary thereto; and to all other laws, ordinances and legal requirements applicable thereto."

1.04 PARAGRAPH 3.5 WARRANTY

A. Add subparagraph 3.5.2 as follows:

"3.5.2 The Contractor shall guarantee and warrant his and his subcontractor's work and materials (including the materials and work of suppliers of the Contract and his subcontractors) for a period of one year from the date of Substantial Completion. This Warranty shall be for a longer period on certain items if so designated in the Specifications. The foregoing one-year guaranty and warranty shall not in any way limit, restrict or affect the liability of the Contractor, or his subcontractors, for indemnity as provided for in this Contract, nor shall it in any way shorten the period of limitation fixed by law for the filing of any action against the Contractor for enforcement of the or breach of any provision of the contract documents. Should the Contractor elect to use any of the equipment in the building during the construction period, he shall make arrangements with the subcontractor or supplier of the equipment for any extension of warranty of that equipment made necessary by such use. The Warranty period for such equipment to the Owner shall not be reduced by the use of equipment by the Contractor".

1.05 PARAGRAPH 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. Add the following to subparagraph 3.12.5 after the second sentence:

"3.12.5 Incomplete or poorly prepared shop drawings or other submittals will be returned to the Contractor to be revised or redrawn prior to resubmittal. The Contractor will hold the Engineer and Owner harmless against claims for losses or injury caused by errors or omissions in the shop drawings or other submittals for the Work made by the Contractor, a subcontractor, any lower tier subcontractor, manufacturer, supplier or distributor."

B. Delete subparagraph 3.12.8 and substitute the following:

"3.12.8 The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Engineer's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Engineer of such deviations in a separate writing or by submitting a separate written request for change at the time of submittal and the Engineer has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Engineer's approval thereof."

1.06 PARAGRAPH 4.2 ENGINEER'S ADMINISTRATION OF THE CONTRACT

A. Add sub-subparagraph 4.2.4.1 as follows:

"4.2.4.1 Any direct communications between the Owner and the Contractor; or between the Contractor or Sub-contractors and the Engineer that affect the performance or administration of the Contract shall be made or confirmed in writing, with copies to the Owner, and any such communications that represent a modification of the Contract requirements will be documented appropriately. Any communications among the Engineer and Subcontractors shall be confirmed in writing to the Contractor, and copied to the Owner.

1.07 PARAGRAPH 4.3 CLAIMS AND DISPUTES

A. Refer to sub-paragraph 4.3.7, Claims for Additional Time and add the following sub-subparagraph 4.3.7.2.1 as follows:

"4.3.7.2.1 In order for a claim for additional time due to adverse weather conditions to be considered valid, the Contractor must show that adverse weather conditions beyond those normally expected have occurred. For claims related specifically to "Rain Days" the following table of normal rain days will be employed to determine if the Contractor is entitled to a time extension. A "Rain Day" is defined as a 24 hour period in which 1/100" (.01") of rain or more falls and is recorded by the National Weather Service or other official reporting service in the immediate vicinity of the project. Extensions of time will be granted if the number of officially reported "Rain Days" is greater than normal during a given month. Claims for additional time must be submitted with the Contractor's monthly payment application for review. Failure to make timely and proper request for additional time will result in no time extension being allowed.

Average Days with 1/100" of Precipitation or More: Northwest Arkansas

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
8	8	9	10	11	9	7	7	7	7	7	7

B. ARBITRATION IS NOT AN OPTION FOR DISPUTE RESOLUTION.

1.08 PARAGRAPH 7.2 CHANGE ORDERS

A. Delete subparagraphs 7.2.1 and 7.2.2 and substitute the following:

"7.2.1 All requests for changes, additions or deductions, shall be submitted in a complete itemized breakdown acceptable to the Owner, including breakout costs for materials and labor, then showing a 15% overhead and profit line item.

7.2.4 The burden of proof of cost rests upon the Contractor. Contractor agrees that Owner or Owner's Representative shall have the right, at reasonable times, to inspect and audit the books and records of Contractor to verify the propriety and granting of such cost.

7.2.5 Compute requests for changes be they additions or deductions as follows:

.1 For work performed by the Contract:

Net cost of material and delivery	a
State Sales Tax	b
Net Placing cost	c
W.C. Insurance Premium and FICA Tax	d
	a+b+c+d
Overhead and profit, 15% X (a+b+c+d)	e
Allowable Bond Premium	f
TOTAL COST	(a+b+c+d)+e+f

.2 Credit for work omitted shall be computed as outlined in 7.2.5.1 "a through e" except the contractor's share of overhead and profit is 7%.

.3 For work performed by Subcontractors:
Subcontractors shall compute their work as outlined in 7.2.5.1 "a through e".
To the cost of that portion of the work (change) that is performed by the subcontractor, the general contractor shall add an overhead and profit change of fifteen (15%) percent plus the allowable bond premium."

1.09 PARAGRAPH 9.3 APPLICATIONS FOR PAYMENT

A. Delete subparagraph 9.3.1 and substitute the following:

"9.3.1 The Contractor shall present to the Owner an application for payment on or before the twenty-fifth day of each calendar month. These periodical estimates for partial payment shall be submitted on forms, prepared at the Contractor's expense and conforming to A.I.A. Document G702. An original and a requested number of copies of such estimate shall be tendered to the Owner."

1.10 PARAGRAPH 9.6 PROGRESS PAYMENTS

A. Delete subparagraph 9.6.1 and substitute the following:

"9.6.1 No later than the 10th day of each calendar month, the Owner will make partial payment to the Contractor, but the Owner will retain 5% of the amount of each payment. Retaining 5% of each payment will continue until 100% of the Contract Work has been completed. The retainage will be placed in escrow and will be paid to the Contractor within 30 days after substantial completion of the project if the Contractor has submitted all Project Record Documents, Maintenance Manuals, Warranties, Guarantees and a complete file set of Shop Drawings. No retainage shall be held on materials properly stored at the site or in the Contractor's bonded or insured warehouse if certificates of insurance or bond

and invoices are provided.

9.6.1.1 Progress payments will be made for work completed or for materials delivered and properly stored, in accordance with subparagraph 9.6.1, through the Contracted Constructed Period. No payments will be made after the Contracted Construction Period has expired until Final Payment,
unless an extension of the Contract Time has been granted. In which case, an additional progress payment will be made for work performed during the extension time period only."

1.11 PARAGRAPH 9.8 SUBSTANTIAL COMPLETION

A. Add the following sub-subparagraphs 9.8.3.1 thru 9.8.3.3 as follows:

“9.8.3.1 If the Owner determines that the Work has still not reached Substantial Completion a second list of deficiencies will be issued to the Contractor.

9.8.3.2 The Contractor will reimburse the Owner for expenses related to these additional services, or, the Owner may choose to withhold money from Progress Payment(s) or from retainage as reimbursement for additional services."

1.12 PARAGRAPH 9.10 FINAL COMPLETION AND FINAL PAYMENT

A. Add sub-subparagraphs 9.10.1.1 thru 9.10.1.4 as follows:

“9.10.1.1 If the Owner determines that the Work has not reached Final Completion a list of deficiencies will be issued to the Contractor.

9.10.1.2 Any additional inspections by the Engineer or Owner to determine Final Completion will be considered additional services and will be billed directly to the Contractor.

9.10.1.3 The Contractor will reimburse the Owner for expenses related to these additional services, or, the Owner may choose to withhold money from Final Payment or from retainage as reimbursement for additional services.

9.10.1.4 Before issuance of the final certificate, the Contractor shall obtain in writing from the bonding company approval of such payment. No certificate issued nor payment made to the Contractor, nor partial or entire use or occupancy of the Contract Work by the Owner, shall be an acceptance of any work or materials not in accordance with this contract."

1.13 PARAGRAPH 11.1 CONTRACTOR'S LIABILITY INSURANCE

A. Delete subparagraph 11.1.2 and substitute the following:

"11.1.2 Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the work until date of final payment and termination of any coverage required to be maintained after final payment. The insurance required shall be written for not less than the following, or greater if required by law:

.1 Workers' Compensation:
(a) State: Statutory
(b) Applicable Federal: Statutory
(c) Employer's Liability: $1,000,000 per accident; $1,000,000 disease limit, policy; $1,000,000 disease limit, individual

.2 Commercial General Liability (including premises-operations); independent contractors protective; products and completed operations) as follows:

(a) Use Insurance Service Office Occurrence Form CG 00 01 07 98 or equivalent. Limits required as follows:

(1)	General Aggregate	$2,000,000
	Products/Completed Operations Aggregate	$2,000,000
	Personal Injury & Advertising Injury	$1,000,000
	Each Occurrence	$1,000,000

(2) Products and Completed Operations to be maintained for one year after final payment.

(3) Property Damage Liability Insurance will provide X, C, or U coverage as applicable.

(b) Comprehensive General Liability. Coverage provided will be on the Comprehensive General Liability form with the Broad Form General Liability Endorsement. Limits provided as follows:

(1) Combined Single Limit: $2,000,000 each occurrence and aggregate

(2) Products and Completed Operations to be maintained for one year after final payment.

(3) Property Damage Liability Insurance will provide X, C, or U coverage as applicable.

(4) Contractual Liability:
Bodily Injury: Combined Single Limit
Property Damage: $1,000,000 Each Occurrence

(5) Personal Injury, with Employment Exclusion deleted: Combined Single Limit $1,000,000 Each Occurrence

(6) Bodily Injury and Property Damage (Combined Single Limit) (any auto, including Owned, Hired and Non-Owned Autos):
Bodily Injury: Combined Single Limit
Property Damage: $1,000,000 Each Occurrence"

B. Add sub-subparagraphs 11.1.3.1 and 11.1.3.2 as follows:

"11.1.3.1 The Contractor shall furnish one copy of each certificate of insurance herein required for each copy of the agreement which shall specifically set forth evidence of all coverage required by subparagraphs 11.1.1 and 11.1.2. Furnish to the Owner copies of any endorsements that are subsequently issued amending coverage of limits."

"11.1.3.2 The Contractor shall not commence work under this contract until he has obtained all insurance with responsible insurance companies satisfactory to the Owner required under this article, and such insurance has been accepted by the Owner. Nothing in this article shall create any obligation on the part of the Engineer to see that the specified insurance is maintained."

C. Add subparagraph 11.1.4 as follows:

"11.1.4 All Subcontractors shall be required to maintain contractors liability insurance the same as required to be maintained by the Prime Contractor as specified in 11.1.1 and the limits of liability shall be not less than those required to be maintained by the Prime Contractor unless their operations are covered to the specified limits by the insurance maintained by the Prime Contractor."

1.14 PARAGRAPH 11.2 OWNER'S LIABILITY INSURANCE

A. Delete subparagraph 11.2.1 and substitute the following:

"11.2.1 The Contractor shall procure and maintain during the term of this contract, Owner's Protective Liability Insurance with an endorsement to the policy to include as additional insured, the Engineer, with limits not less than $2,000,000 each occurrence and $2,000,000 in the aggregate for property damage liability. The Owner shall not be required to indemnify anyone nor to provide insurance."

1.15 PARAGRAPH 11.4 PROPERTY INSURANCE

A. In subparagraph 11.4.1, in the first line, change the word "Owner" to "Contractor".

B. Delete sub-subparagraph 11.4.1.2 and substitute the following:

"11.4.1.2 The Owner shall not be required to indemnify anyone nor to provide insurance. If the Owner is damaged by the failure or neglect of the Contractor to purchase or maintain insurance as described above, then the Contractor shall bear all reasonable costs properly attributable thereto."

C. In sub-subparagraph 11.4.1.3, change each occurrence of the word "Owner" to "Contractor".

D. In subparagraph 11.4.2, in the first line, change the word "Owner" to "Contractor".

E. Delete subparagraph 11.4.4 and substitute the following:

"11.4.4 If the Owner requests in writing that insurance for risks other than those described herein or for other special hazards be included in the property insurance policy, the Contractor shall, if possible, include such insurance, and the cost thereof shall be charged to the Owner by appropriate change order."

F. In subparagraph 11.4.6, change each occurrence of the word "Owner" to "Contractor" and change each occurrence of the word "Contractor" to "Owner".

G. In subparagraph 11.4.8, change each occurrence of the word "Owner('s)" to "Contractor('s)".

H. Delete subparagraph 11.4.9 and substitute the following:

"11.4.9 If required in writing by a party in interest, the Contractor as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Contractor's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Contractor shall deposit in a separate account proceeds so received, which the Contractor shall distribute in accordance with such agreement as the parties in interest may reach, or in accordance with an arbitration award in which case the procedure shall be as provided in Paragraphs 4.5 and 4.6. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a change in the Work in accordance with Article 7."

I. In subparagraph 11.4.10, change each occurrence of the word "Owner" to "Contractor".

1.16 PARAGRAPH 11.5 PERFORMANCE BOND AND PAYMENT BOND

A. Add subparagraph 11.5.3 as follows:

"11.5.3 The performance-payment bond shall be in compliance with the laws of the State in which the Work is to be performed and as stipulated in Document 00600, Bonds of these specifications."

END OF DOCUMENT 00800

GENERAL MECHANICAL REQUIREMENTS
SECTION 15010

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

A. Comply with the Conditions of the Contract, General and Supplementary Conditions, and any other applicable requirements contained herein or issued under separate cover.

B. Perform other work related to or necessary for the mechanical installation in accordance with the applicable Specification Division or Section contained herein.

C. In Mechanical Specification Sections, items under "RELATED WORK" are listed for convenience only and are not guaranteed to be a complete listing of all applicable work.

1.02 CODES, REGULATIONS AND STANDARDS:

A. Comply with the latest edition of applicable codes including the following:

1. International Building Code
2. Arkansas State Plumbing Code
3. Arkansas State Gas Code
4. Life Safety Code (NFPA 101)
5. National Electrical Code (NFPA 70)
6. Arkansas State Fire Prevention Code
7. Arkansas Gas Pipeline Code
8. Arkansas Building Code

B. Comply with applicable Regulations as amended, including the following:

1. Arkansas State Department of Health Regulations
2. Arkansas Department of Labor Regulations
3. Occupational Safety and Health Act (OSHA)
4. Utility Company Regulations and Requirements
5. Other State and Federal Laws and Regulations
6. Local Ordinances

C. Furnish products and perform installation conforming to the latest accepted Standards published by the following organizations:

1. Underwriter's Laboratories, Inc. (UL)
2. National Fire Protection Association (NFPA)
3. National Electrical Manufacturer's Association (NEMA)
4. American Society of Testing Materials (ASTM)
5. American National Standards Institute (ANSI)
6. Air Movement and Control Association (AMCA)
7. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
8. American Society of Mechanical Engineers (ASME)
9. American Water Works Association (AWWA)
10. American Refrigeration Institute (ARI)
11. American Gas Association (AGA)
12. Cast Iron Soil Pipe Institute (CISPI)
13. Midwest Insulation Contractors Association (MICA)
14. Sheet Metal and Air Conditioning Contractor’s National Association (SMACNA)

15. Insurance Service Office (ISO)
16. Factory Insurance Association (FIA)
17. Factory Mutual (FM)
18. Institute of Boiler and Radiator Manufacturers (IBR)
19. National Environmental Balancing Bureau (NEBB)
20. Associated Air Balance Council (AABC)
21. American Society of Sanitary Engineers (ASSE)
22. Plumbing and Drainage Institution (PDI)
23. National Sanitation Foundation (NSF)

D. In case of discrepancy or conflict between Codes, Regulations, Standards, Drawings and/or Specifications, the requirement yielding the higher(est) quality of work shall govern.

1.03 ADMINISTRATIVE FEES:

A. Obtain and maintain all necessary licenses, permits and inspections and pay all fees including taxes and penalties, if any, required by the Administrative Authority. Refundable deposits will be paid by the Owner.

1.04 PRE-CONSTRUCTION SUBMITTALS:

A. Submit for approval, Manufacturer's technical data sheets including performance specifications for all equipment and air devices shown on the schedules. Also provide data on all system accessories and all materials. Include all piping, ductwork and insulation materials. Accessories to be submitted on shall include valves and all piping accessories, and all duct accessories including extractors, turning vanes, control dampers and balancing dampers.

B. Submit for approval, Contractor's original Shop Drawings of all assemblies of manufactured items including control diagrams. Submit all items called out in individual sections, in addition to those called for in this section.

C. Indicate all pertinent dimensions on scale drawings necessary for clarity and/or coordination of the installation between trades.

D. Provide complete electrical data and wiring diagrams.

E. Make Submittals on all work contained in Division 15, Mechanical at one time except by special permission.

F. Bind Submittals in durable cover(s) with contents conveniently organized and properly indexed with index tabs.

G. Obtain approval on product manufacturers not specifically named prior to making submittals.

H. Each Mechanical Section contains a listing of required Submittals only for convenience.

I. Submit for approval a schedule of nameplates and manufacturer's data sheets and Shop Drawings on special supports and seals.

J. Provide performance data on all substituted items to demonstrate equality to those scheduled. Include all sound level, rpm, velocity and other data as it is applicable.

K. Submit proposed changes in ducts, pipes or equipment layout before ordering or fabrication as stated below under "Intent".

1.05 INTENT:

A. It is intended that the Contractor provide a complete and operating mechanical system including all incidental items and connections necessary for proper operation or customarily included even though each and every item may not be indicated.

B. The Drawings indicate the general layout requirements for equipment, fixtures, piping, ductwork, etc. Final layout will be governed by actual field conditions with all measurements verified at the site. Contractor shall verify that all equipment, ducts, pipes and all other components will fit in the space provided before fabrication or ordering. Contractor shall submit any proposed changes to the Engineer for approval before ordering or fabrication.

C. It is intended that the mechanical installation be safe, reliable, energy efficient and easily maintained with adequate provisions allowed for access to equipment.

D. It is intended that the mechanical system operate quietly with noise levels below the criteria recommended for the application by ASHRAE. Provide corrective action as required to reduce objectionable noise or vibration.

PART 2 - PRODUCTS

2.01 PRODUCT REQUIREMENTS:

A. Furnish only new standard products of a manufacturer regularly engaged in the production of said products.

B. Support all products by service organizations with adequate spare parts inventory and personnel located reasonably close to the site.

C. Where multiple units of the same type or class of products are required, provide all units of the same manufacturer.

2.02 PRODUCT HANDLING:

A. Store products in the original containers and shelter in a suitable environment at an approved location. Make readily accessible for inspections and inventory accounting.

2.03 PRODUCT SUBSTITUTIONS:

A. For products specified by generic reference standard, select any product meeting such standard.

B. For products specified by naming one or more products or manufacturers, select any named. Submit request, in writing, for substitution of any product or manufacturer not specifically named and obtain approval at least five working days prior to bid date.

C. Provide all information required to support claim of "equality" of product proposed for substitution. Substitutions will be considered only if equivalent in quality, efficiency, performance, size, weight, reliability, appearance, and ease of maintenance to the specified product or manufacturer.

D. Where approved product substitutions alter the design, space requirements, electrical requirements, connections, or etc., include all work necessary to provide a complete installation of quality equal to or better than that which would have been achieved with products or manufacturers as specified.

2.04 MECHANICAL IDENTIFICATION:

A. Identify each major component as to manufacturer's name, address, model number, serial number, and pertinent ratings on a durable plate attached to the component in a conspicuous place.

B. Identify each major component as it is named on the Drawings or referred to herein with engraved nameplates made from laminated plastic sheets.

1. Furnish with white letters on black background except for other color coded requirements.
2. Provide appropriate size nameplates with information easily readable.
3. Submit for approval a schedule of nameplates to be affixed to each major component.
4. Attach nameplates with approved adhesive on factory baked enameled surfaces only. Attach nameplates with proper screws on field painted and all other surfaces.

C. For hydronic systems only:

1. Identify each valve, except obvious equipment isolation valves, with black filled coded numbers engraved on 1-1/2” diameter brass nametag attached with brass jack chain. Provide typewritten legend of numbered valves. Frame under glass and mount on the wall where directed. Include at least the following information in the legend:

a. Fluid conveyed
b. Function of valve or area affected
c. Normal position (s)
d. Emergency instructions where appropriate
e. Location of the valve

2. Identify each pipe or duct exposed in equipment rooms or accessible above lay-in ceiling or behind access doors with permanent markers as manufactured by Seton or Brady. Indicate fluid conveyed and direction of flow. Install on each pipe or duct where it enters or leaves a wall or floor and at other intervals not to exceed 20 feet.

D. Identify outdoor underground lines with continuous strip of plastic utility maker tape s manufactured by Seton stating at regular intervals “CAUTION (state utility) PIPE BELOW”. Install one foot directly above pipe before backfilling to grade.

2.05 ANCHORS:

A. Size anchors for minimum safety factor of two times recommended load. Use only corrosion resistant materials.

B. In new concrete, use malleable iron inserts set prior to pouring concrete.

C. In existing concrete or solid masonry, use Phillips "Redhead" expansion shields or Elcen self drilling expansion shields. Use power driven fasteners only for light loads and with specific approval.

D. In hollow masonry, use steel toggle bolts.

E. On structural steel, use approved beam clamps or direct weld.

F. In wood, use wood screws or lag screws or through bolts with nuts and washers.

G. In sheet metal, use self tapping sheet metal screws or machine bolts with washers and nuts.

H. In bar joists, use hanger rod between bottom angles secured with washers and nuts.

2.06 HANGERS AND SUPPORTS:

A. Generally, support piping in accordance with ANSI B31.1 and support ducts in accordance with SMACNA duct construction standards.

B. Support horizontal steel and copper pipe as follows:

1. For pipe sizes 2" and smaller, use adjustable wrought steel ring or clevis hanger spaced at 5 feet on center with 3/8" steel hanger rod.
2. For pipe sizes 2-1/2" through 4", use adjustable wrought steel clevis spaced at 10 feet on center with 5/8" steel hanger rod.
3. Support high temperature pipe with pipe roller hangers to allow for expansion.

C. Support cast iron soil pipe 4" and smaller with adjustable wrought steel ring or clevis hanger spaced at 5 feet on center with 5/8" steel hanger rod.

D. Support PVC pipe with approved hangers at 4 feet on center.

E. Provide trapeze hangers consisting of steel angles or channels with spacers and steel hanger rods for multiple piping or duct runs.

F. Provide copper plated hangers if in contact with copper piping.

G. Provide 18 gauge galvanized saddles for insulated pipe and size hanger to accommodate pipe and insulation.

H. Use steel riser clamps for vertical piping support through floors. Provide steel bracket and wrought steel clamp for support from walls.

I. Support ducts with steel bands, steel angles, or steel channels near each transverse joint.

J. Support piping on roof with 4"x4"x2' redwood blocks with wooden saddle formed to fit pipe and nailed to block. Loosely clamp pipe to saddle with steel straps.

2.07 EQUIPMENT SUPPORTS

A. All roof mounted equipment where support is not specified elsewhere in this specification shall use mode RTU-20 equipment supports.

B. All roof supports shall be manufactured by Portable Pipe Hangers

2.08 CONCRETE BASES:

A. Provide concrete bases for floor mounted equipment indicated on the Drawings and all exterior equipment mounted on grade. Use proper cement-sand mix to achieve strength of 3000 psi after 28 days.

B. Provide steel reinforcing bars as required and provide proper ties and support during pouring.

C. Establish sizes of bases required to accommodate equipment. Generally, make bases extend 3" larger than equipment.

D. Provide properly sized anchor bolts held in position with templates. Where anchor bolts cannot be held in sufficient alignment, provide adjustable bolts in pipe sleeves.

E. Prior to pouring, set steel re-bar dowels in holes drilled in existing slab for proper anchorage of base.

Install near each corner and at other intervals not to exceed 24 inches.

F. Trowel finish and rub smooth. Form edges with 3/4" chamfer.

G. Grout bases for pumps and other vibrating equipment with non-shrink grout.

2.09 SLEEVES:

A. For pipes or round ducts through dry floors above grade or interior walls, form sleeves with 18 gauge galvanized sheet metal. Sleeves are not required in non fire rated dry wall construction nor slab on grade.

B. For pipes through outside walls, firewalls, concrete beams, footings or potentially wet floors, provide schedule 40 galvanized steel pipe sleeves. Provide integral waterstop in outside wall sleeves.

C. For rectangular ducts through walls or floors, form sleeves with steel angles or channels or galvanized sheet metal.

D. Extend sleeves through floors one inch above floor and seal watertight. For core drilled penetrations in existing floors, provide one inch angle rings set in sealant in lieu of sleeves. Make wall sleeves flush with wall.

E. Size sleeves to allow for movement due to expansion and to provide for pipe insulation run continuous through sleeves.

F. Where pipes or ducts pass through sleeves, completely fill space with insulation or approved fire barrier materials. Provide tight fitting escutcheon plates on both sides of wall sleeves as follows:

1. Galvanized sheet metal caps for ducts.
2. Galvanized or cad plated plates for pipes in mechanical spaces or unfinished areas.
3. Chrome plated brass for pipes in finished areas.

2.10

A. Where piping penetrates roof membrane, provide 30 inch square sheet of 5 lb/sq. ft. lead or 18 gauge copper. Extend flashing into top of open vent pipes one inch or provide flashing assembly or pitch pan as recommended by roofing manufacturer.

B. Flash floor drains, except in slab on grade, with copper sheet flashing. Extend flashing under tile or floor finish to 6 inches up wall in showers or 2 feet from floor drain. Clamp flashing to auxiliary drain collar on floor drain.

C. Provide curbs for all roof mounted equipment. Make curbs minimum of 4 inches above flood level of roof. Flash and counter flash with galvanized sheet metal, soldered and properly waterproofed.

D. Where piping penetrates outside walls, make watertight with oakum and sealant or provide modular rubber seal designed for the purpose.

PART 3 - EXECUTION

3.01 MANUFACTURER'S DIRECTIONS:

A. Handle, install, connect, test, and operate all products, assemblies, and systems in accordance with

manufacturer's recommendations.

B. In case of conflicting requirements between the manufacturer's directions and the Contract Documents, obtain instructions before proceeding with the work.

3.02 INSPECTIONS:

A. Arrange with the Administrative Authority for inspections of all work required and obtain approval prior to concealing or proceeding with the work.

B. Give adequate notice before concealing any work for inspections by the Architect or Owner's representatives. Obtain instructions to proceed before concealing the work.

3.03 CLEANING:

A. Keep the premises clean and free from debris, dirt, etc.

B. Upon completion of the work, clean and polish all fixtures, equipment, etc.
C. All ductwork shall be sealed during construction to prevent construction dust from entering ductwork.

3.04 WORKMANSHIP:

A. Perform all work in accordance with the best practices of the trade and provide a "neat" installation by mechanics skilled in their respective trades and properly licensed.

B. Accurately install piping, ductwork, and other equipment, plumb, level, and true to line with runs parallel or perpendicular to building lines. Make bends or offsets uniform.

C. Carefully perform all cutting, drilling, digging, etc., and patch or refinish the disturbed area to the condition of adjoining or similar surfaces in an approved manner. Do not cut any structural member without specific approval. Do not cut any electrical or mechanical lines that may be concealed.

D. Conceal piping, ductwork, etc. in chases, furrings, or above ceilings unless indicated otherwise. Flush mount equipment required in finished walls where possible.

E. Coordinate with other trades work and install all work so that all systems and components can be easily maintained and can be removed for replacement in the future.

F. Provide access to all equipment. Do not locate components that must be serviced, maintained, or replaced above hard ceilings. Where these components absolutely must be above hard ceilings or in side walls, provide access doors equal to Acudor 5050. Provide fire rated access doors equal to Acudor FW5050 in fire rated ceilings or walls.

3.05 FLAME AND SMOKE CONSIDERATIONS:

A. In ducts or other enclosures used for transporting environmental air, including return air plenums above ceilings, use only products conforming to NFPA and UL composite classifications not exceeding 25 for flame spread and 50 for smoke developed ratings. This requirement applies to all materials including adhesives, finishes, etc.

B. Completely seal penetrations through fire and/or smoke rated walls, ceilings, floors, or other barriers for the passage of piping, ductwork, etc. with a UL listed material to preserve the fire/smoke rating of the barrier.

C. Provide approved fire dampers in air ducts penetrating fire barriers requiring a fire construction rating one hour or greater. Maintain access to fire damper fusible link.

3.06 COORDINATION:

A. Coordinate the mechanical work with the work of related trades to avoid interference's. Determine the exact route of piping and ductwork prior to fabrication and the exact location of each outlet and equipment connection prior to installation.

B. Study the Architectural, Structural, Mechanical and Electrical Drawings, and Specifications including Shop Drawings and manufacturer's technical data sheets, and compare to actual site conditions and constraints. In case of conflicts or interference, obtain clarification or instructions before performing any work.

C. Piping or equipment requiring slope or specific mounting elevations will generally have right of way over products whose elevations can be changed.

D. Carefully plan the sequence of work as required to minimize disruptions and installation time.

3.07 EQUIPMENT CONNECTIONS:

A. Make all required utility connections to each item of equipment shown or specified including equipment furnished by Owner, and make operational.

B. Connect overflows, relief discharges, blowdowns, drain valves, etc. with approved piping and extend to floor drains or other approved discharge points.

C. Make all electrical connections to equipment including power supply and control wiring in accordance with Division 16, Electrical.

3.08 PROTECTION REQUIREMENTS:

A. Locate existing utility lines and adequately identify and protect during the execution of the work.

B. Protect public and private property against damage.

C. Protect all work including building finishes against damage due to dirt, water, chemicals, frost, heat, handling, theft, etc. Keep openings in piping and ductwork and equipment closed with suitable plugs or caps during installation.

D. Provide necessary warning devices, barricades, or coverings required for safety around moving parts, sharp objects or high temperature surfaces.

3.9 CHASES AND OPENINGS:

A. Provide templates or details for chases and other openings required through floors, walls, ceilings, etc. to accommodate piping or ductwork.

3.10 TRENCHING AND BACKFILLING:

A. Excavate bottoms of trenches to required depth and grade for proper slope with uniform and solid bearing for piping. Do not lay pipe on mud, rocks, or unstable soil. Remove unsuitable bearing material and backfill to proper depth with sand or other approved material. If limestone products are used, protect all copper piping from contact with the limestone using sealed insulation or approved sleeving material.

B. After piping has been satisfactorily leak tested and approved, backfill trench to a depth of one foot above top of pipe with sand or fine pea gravel. Install continuous strip of plastic "CAUTION" tape over pipe and sand. Use suitable material for remaining backfill to finished grade, tamped to 95% compaction.

C. Before beginning any trenching, locate and determine elevation of all affected piping. Verify that drain lines to be connected to are deep enough to allow sufficient slope before starting trenching.

3.11 PIPING INSTALLATION:

A. Erect piping without forcing or springing and allow for proper clearance and headroom.

B. Provide for expansion and contraction with piped loops, changes in direction, or approved expansion couplings.

C. Install all piping in a manner to prevent freezing. If necessary to install water piping in unheated spaces or outdoors above the frost line, provide electric heat tracing around pipe prior to insulating.

3.14 PAINTING:

A. Paint ductwork, piping, equipment, etc. exposed in finished areas to match adjacent surfaces as directed. Paint items flat black or as directed if visible through grilles or other openings.

B. Paint all exposed piping and equipment in mechanical spaces for uniform appearance or identification as directed.

C. Paint ferrous piping, equipment, hangers, etc. exposed outdoors or subject to rusting, with one coat primer and two coats of approved exterior enamel based paint.

D. Paint roof mounted and other outdoor equipment to uniformly match background or adjacent surfaces as directed.

E. Paint plywood backboards used for mounting equipment.

3.14 LABELING

A. For any fresh air vents located on the roofs, the vents shall be properly marked with the words “intake vent” permanently attached to the vent.

3.15 CONDENSATE LINES

A. Install condensate piping for all condensate-producing equipment using manufacturer’s approved and recommend traps, connections, slope, and methods. Route condensate lines to nearest roof drain if roof mounted equipment. Route condensate lines per plans if indoor equipment. Do not route to sanitary sewer lines nor terminate such that condensate will cross a sidewalk. Use only condensate piping materials as described on the piping schedule on the plans.

3.16 POST CONSTRUCTION SUBMITTALS:

A. Deliver special tools, lubricants, and other products necessary for proper operation and maintenance of the mechanical systems.

B. Deliver spare parts as called for under other Mechanical Sections contained herein or on the Drawings.

C. Submit Project Record Documents indicating all changes from the Contract Documents made during construction.

D. Submit Certificates of Final Inspections from the Administrative Authority.

E. Submit Operation and Maintenance Manuals covering all phases of equipment and systems provided. Include complete spare parts data with current prices and sources of supply. Include copy of manufacturing data sheets and shop drawings required in pre-construction submittals.

F. Submit extended warranties in excess of the standard one year warranty where required by other Mechanical Sections contained herein or on the Drawings.

G. Submit TAB report on approved record forms.

3.18 INSTRUCTIONS TO OWNER:

A. Provide competent instruction to Owner's personnel covering operation and maintenance of all mechanical systems. Provide specialized instruction by manufacturer's technical representatives when required.

END OF SECTION

MECHANICAL INSULATION
SECTION 15250

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. Above ground domestic water piping insulation

1.02 RELATED WORK:

A. Section 15010 General Mechanical Requirements

B. Section 15412 Domestic Water Piping System

1.03 SUBMITTALS:

A. Submit Manufacturer's Data Sheets on each type of insulation to be used.

1.04 QUALITY ASSURANCE:

A. Perform installation in accordance with MICA, Commercial and Industrial Insulation Standards.

B. Follow manufacturer's directions on adhesive application, fastener spacing, etc.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Glass fiber type equal to Owens-Corning Fiberglass 23ASJ\SSL for 1/2" and greater thickness.

1. K-factor no greater than 0.24
2. Jacket permeance no greater than 0.02 perms.
3. Self sealing laps on longitudinal and transverse joints of all service jacket.
4. J-M "Zeston" PVC fitting covers over Fiberglass inserts for valves and fittings. Provide 25/50 flame/smoke rating when used in air plenums.

B. Flexible elastomeric pipe insulation equal to Armstrong "Armaflex" for 1/2" and less thickness.

1. Use proper adhesive.
2. Use sheets cut and molded around valves and fittings.
3. Do not use in air plenums unless 25/50 flame/smoke rated.

C. Acoustical Fiberglass interior duct liner with 1-1/2 lb. density and coated face. Meet UL 181 on erosion tests and NFPA 90A on flame/smoke rating.

D. Flexible Fiberglass exterior duct wrap equal to FRK-25.

1. K-factor no greater than 0.3.
2. 3/4 lb. density.
3. Foil reinforced kraft (FRK) vapor barrier.

E. Foam/vinyl safety covers for drains & supply lines equal to Plumberex "Handy-Shield."

1. White vinyl cover over insulating foam liner.

2. Locking strap with recloseable sealing strips and weep seam.
3. Meet Federal Std. 4.19.4 GSA and ANSI A117-1-1980.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Successfully perform all leak tests prior to applying insulation.

B. Provide aluminum sheet metal jacket over insulation exposed outdoors above grade. Use rivets and seal joints watertight.

C. Provide approved coating of mastic over piping insulation jackets installed underground and make waterproof and puncture resistant.

D. Insure surfaces are clean and dry prior to installing insulation.

E. Neatly finish insulation at hangers or other protrusion. Seal vapor barrier joints in duct wrap with FRK duct tape.

3.02 INSULATION SCHEDULE:

See drawings for insulation schedule.

END OF SECTION

DOMESTIC WATER PIPING SYSTEM
SECTION 15412

PART I - GENERAL

1.01 WORK INCLUDED:

A. Water Service Piping

B. Hot and Cold Water Piping

C. Temperature and Pressure (T&P) Relief Piping

D. Valves

E. Shock Suppressors

1.02 RELATED WORK:

A. Section 15010 General Mechanical Requirements

B. Section 15250 Mechanical Insulation

C. Section 15440 Plumbing Fixtures and Trim

1.03 SUBMITTALS:

A. Submit manufacturer's data sheets on valves and shock suppressors.

B. Submit list of piping products to be used and state their manufacturers, classes or types, and other applicable data.

C. Submit Shop Drawings of shock suppressors layout proposed.

D. Submit record drawings indicating actual location and routing of installed piping.

E. Submit certificate of completion of chlorination.

PART 2 - PRODUCTS

2.01 PIPING:

A. For underground water service piping outside building to water meter:

1. ASTM B88 type as indicated on drawings hard copper tubing with wrought copper fittings and joints made with approved solder.
2. Thickness Class 50, cement lined, seal coated, hub and spigot type ductile iron with joints made with rubber compression rings manufactured for the purpose. (Optional)

B. For underground water piping inside building and to five feet outside building:

1. 1" and smaller - ASTM B88 type as indicated on drawings soft copper tubing with no fittings or joints permitted under slab. Make connections above slab using wrought copper fittings and 95-5 solder.
2. 1-1/4" and larger - ASTM B88 type as indicated on drawings hard copper tubing with wrought copper fittings and joints make with Sil-Fos Solder (15% silver content).

C. For exposed piping in toilet rooms and other finished areas, use chrome plated brass pipe with threaded fittings.

D. For above ground water and T&P relief piping inside building, use ASTM B88 type as indicated on drawings hard copper tubing with wrought copper fittings and joints made with 95-5 solder.

E. Solder containing lead shall not be used on potable water systems.

2.02 VALVES:

A. Provide valves with suitable materials including discs, plugs, balls, gaskets, linings, and lubricants for the service, temperature, and pressure to which they will be exposed. Furnish with solder or screwed connections.

B. Gate Valves: Bronze, non-rising stem, inside screw, double wedge.

C. Globe or Angle Valves: Bronze, rising stem, inside screw, renewable composition disc.

D. Check Valves: Bronze with swing disc.

E. Standard Hose Bibbs (HB): Bronze, replaceable disc, hose thread outlet with vacuum breaker.

F. Freeze Proof Hose Bibbs (FPHB): 3/4" anti-siphon non-freeze type with bronze casing and box with loose key handle. Furnish for proper wall thickness.

G. Garbage Can Wash Valve (GCWV): 3/4" non-freeze mixing type with hot and cold water connections, bronze casing and deep box with loose key handle. Provide vacuum breaker and furnish for proper wall thickness. Wade W-8606-HC.

H. Pressure Reducing Valves (PRV): Bronze with 125 psig inlet pressure and 50 psig adjustable outlet pressure. Furnish same size as pipe.

I. Temperature and Pressure Relief Valve (T&P): Bronze with test lever. Size to handle BTU/hr. rating of water heater.

2.03 SHOCK SUPPRESSORS:

A. Provide manufactured "Shockstops" of all stainless steel construction with welded nested bellows or piston type and pre-charged with nitrogen. Size and locate in accordance with PDI-WH201 and manufacturers instructions. Air chambers are not allowed.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Ream pipes and tubing and thoroughly clean inside and outside prior to connecting.

3.02 INSTALLATION:

A. Slope water piping minimum of 1 inch in 40 feet and arrange to drain at all low points.

B. Bury all underground outside piping a minimum of 3 feet below finished grade.

C. Use electrically insulating type connections for joining dissimilar metals such as brass valves or adapters or insulating couplings.

D. Use proper adapters for screwed valves to copper piping.

E. Use teflon tape or other approved joint compound to connect threaded pipe.

F. Connect to T&P relief valve and extend full size to approved discharge point.

G. Where pipe passes through finished wall, ceiling, or floor, provide chrome plated escutcheon plate securely anchored to pipe. Install pipe so that no threads show.

H. Arrange with local utility for water tap and meter installation. Pay all costs to establish water services.

I. Install gate valve to isolate or shut-off equipment or branch lines. Use globe valves where adjustable flow or throttling is required.

J. Install hose bibbs centerline, 2 feet above floor or grade. Install garbage can wash valve 4 feet above floor or drain.

K. Provide PRV to limit maximum static pressure at plumbing fixtures to 70 psig. Submit pressure data taken at different times as approved or install PRV at service connection or in building. Provide PRV at other separate fixtures when shown on Drawings.

L. Make provisions necessary to prevent cross connections with sanitary drainage system or other non-potable sources. Provide reduced pressure type backflow preventers when required.

3.03 TESTING:

A. Before concealing or insulating, test domestic water piping and prove leak free. Subject system to minimum hydrostatic pressure of 100 psig and hold for one hour.

3.04 STERILIZATION:

A. After tests have been successfully completed, thoroughly flush and sterilize the completed domestic water system in accordance with AWWA C601.

B. Flush entire system after sterilization until residual chlorine content is no greater than 0.2 parts per million.

C. Chlorinate only when the building is unoccupied.

END OF SECTION

NATURAL GAS PIPING SYSTEM
SECTION 15413

PART I - GENERAL

1.01 WORK INCLUDED:

A. Underground natural gas service piping

B. Interior natural gas piping

C. Exterior exposed natural gas piping

D. Connectors for appliances and other equipment

E. Cocks

1.02 RELATED WORK:

A. Section 15010 General Mechanical Requirements

B. Section 15780 Packaged Combination Heating-Cooling Units

C. Section 15620 Fuel Fired Heaters

1.03 SUBMITTALS:

A. Submit manufacturer's Data Sheets on gas cocks.

B. Submit list of piping products to be used and state their manufacturers, classes or types, and other applicable data.

C. Submit record drawings indicating actual location and routing of piping as installed.

1.04 QUALITY ASSURANCE:

A. Conform to ASME Code and applicable state regulations with all welding materials and welding operator's qualifications. Use only operators fully qualified and certified under the requirements of the Arkansas Gas Pipeline Code (AGPC).

PART 2 - PRODUCTS

2.01 PIPING:

A. Underground piping:

1. Plastic pipe or tubing and fittings conforming with ASTM D 2513. Reinforced epoxy resin gas pipe and fittings conforming to ASTM D 2517 for outside underground use only. Plastic shall be used only below grade. Plastic pipe and fittings shall be joined by approved methods and manufacturing instructions.
2. Mill coat pipe with high density polyethylene over adhesive undercoating.
3. Wrap field joints and fittings with Republic “X-Tru-Tape” or equal per manufacturer’s recommendations.

B. Above ground piping:

1. Schedule 40 black steel or galvanized steel with malleable iron fittings or welded joints with buttweld fittings.
2. Stainless steel tubing, fittings, and accessories shall be tested, listed, and installed per ANSI/AGA LC-1, MFPA and Factory Mutual. Shall have polyethylene jacket. Shall meet state and local approvals. Shall be equal to trace pipe by Omega Flex.

C. Connectors for appliances and other equipment:

1. PVC coated spiral flexible brass connector with brass flared gas tubing fittings.

D. Cathodic Protection - Packaged magnesium anodes.

E. Welding Rod - Same material as pipe.

2.02 GAS COCKS:

A. Iron body with brass plug and washer with screwed or flanged ends rated for 125 lb. WOG.

PART 3 - EXECUTION:

3.01 PREPARATION:

A. Ream pipes and tubing prior to connecting.

B. Remove welding slag from welded connections.

3.02 INSTALLATION:

A. Slope natural gas piping minimum of 1 inch in 40 feet and provide minimum 12" deep drip pocket same size as pipe, at all low points and at final connections to equipment. Provide malleable iron removable screw-on cap on bottom of drip pocket.

B. Bury underground gas piping minimum of 2 feet below finished grade.

C. Provide one or more anodes, sized for pipe size and length of underground service.

D. Use flexible connector and gas cock for final connection to each appliance or other gas fueled unit.

E. Provide dielectric union where piping emerges from underground.

F. Weld all connections where piping must be concealed. Provide ventilated pipe sleeves where required.

G. Use teflon tape or other approved joint compound to connect threaded pipe.

H. Arrange with local utility for gas tap and meter installation. Pay all costs to establish natural gas service.

I. Make sure all piping concealed in walls or other areas are properly vented. At top of solid walls vent with opening which is 2 times the diameter of the pipe.

J. Provide ventilated pipe sleeves under all paving and other hard surfaces.

K. Bond interior metal gas piping to the electrical system ground. Piping shall be electrically continuous.

L. Install continuous strip of plastic utility marker tape over gas piping. Use strip with trace wire for plastic pipe.

M. Identify and label medium pressure gas piping at both ends and the 6 foot intervals in between.

3.03 TESTING:

A. Before concealing, test natural gas piping system and prove leak free. Subject system to at least 50 psig air pressure for 30 minutes.

B. Check underground piping coating with a "Holiday" detector and prove free from leakage currents through coating.

END OF SECTION

HYDRONIC SYSTEM
SECTION 15510

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. Chilled and hot water heating system piping

B. All associated fittings and other accessories

C. Pumps

D. Valves

E. Air separators

F. Expansion tanks

G. Backflow preventor

H. Water Treatment

I. Glycol Solution

1.02 RELATED WORK:

A. Section 09900 Painting

B. Section 15250 Mechanical Insulation

C. Section 15711 Mechanical Draft Closed Circuit Evaporating Coolers

1.03 QUALITY ASSURANCE:

A. Welding materials and labor to conform to ASME Code and applicable state Labor Regulations.

B. Use welders fully qualified and licensed by state authorities.

1.04 SHOP DRAWINGS:

A. Submit actual performance data on all equipment and accessories contained within this section.

B. Prepare submittals in accordance with Section 15010 -- General Mechanical Requirements.

C. Provide shop drawings drawn to scale and showing sizes and location of all piping, equipment and accessories.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Pumps and System Accessories:

1. Amtrol
2. Bell & Gossett
3. Armstrong
4. Aurora
5. Victaulic

B. Valves:

1. Nibco
2. Crane
3. Milwaukee
4. Jenkins
5. Nordstrom
6. Victaulic

2.02 PIPE AND FITTINGS: Refer to Plans

2.03 UNIONS AND COUPLINGS:

A. Size 2-1/2 inch and under: 150 psi malleable iron, bronze to iron ground joint unions for threaded ferrous piping air tested for gas service, all bronze for copper piping.

B. Size 3 inch and over: 150 psi forged steel slip-on flanges for ferrous piping, 150 psi bronze flanges for copper piping. Gaskets: 1/16 inch thick performed synthetic rubber bonded asbestos.

C. Grooved mechanical pipe coupling fittings, valves and other components may be used in lieu of welding, threading, flanged or sweat methods, on all pipe 2” and up. All grooved components shall be of one manufacturer, Victaulic, and conform to local code approval, and/or as listed by ANSI – B-31.1, B-31.3, B-31.9, NSF 61 for hot and cold water, ADME, UL/ULC, FM, IAPMO or BOCA. Grooved end product manufacturer to be ISO-9001 certified. Grooved couplings shall meet the requirements of ASTM-F-1476 Flexible couplings, Style75/77 shall only be used in sets of three where flex connectors are to be eliminated, or where deflection is required. Rigid couplings shall have an angled bolt pad. All couplings shall assemble with metal to metal bolt pad contact to insure proper installation. The manufacturer must hold a training class, at the job site, for the contractor. The class shall cover the proper installation of materials, as well as the proper way to groove pipe.

2.04 STRAINERS:

A. Size 2-1/2 inch and under: Screwed, iron body, Y pattern with 1/32 inch stainless steel perforated screen.

B. Size 3 inch to 4 inch: Flanged iron body or grooved end ductile iron, Y pattern with 3/64 inch stainless steel perforated screen.

C. Size 5 inch and larger: Flanged iron body grooved end ductile iron , basket pattern with 1/8 inch stainless steel perforated screen.

D. Screen free area minimum three times area of inlet pipe. Provide valved drain and hose connection off strainer bottom.

2.05 EXPANSION TANK:

A. Use pressurized, bladder type equal to AMTROL Model AX.

2.06 AIR SEPARATORS:

A. Centrifugal type for 125 psi operating pressure, with steel tank, 3/16 inch galvanized steel perforated strainer, perforated stainless steel air collector, and drain connection.

B. Provide on suction side of system circulation pump with AMTROL #720 air elimination valve.

2.07 MANUAL AIR VENTS:

A. Construct manual air vents from 1/4" Crane #702 pet cock and a 2 foot length of 1/4" copper tube.

B. Connect pet cock to all high points in piping system. Connect 2 foot length of 1/4" copper tubing to outlet of pet cock and coil above ceiling.

2.08 RELIEF VALVES:

A. ASME rated direct spring loaded type, lever operated, non-adjustable factory set discharge pressure.

B. Provide relief valves on pressure tanks, low pressure side of reducing valves, heating converters, and expansion tanks.

C. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

2.09 PUMPS:

A. Primary system pumps shall be equipped with mechanical seals, open drip-proof motor with maximum speed of 1750 rpm. Pumps shall be centrifugal, single stage, with cast iron casing, steel shaft, bronze fitted, and furnished with auxiliary pan.

2.10 VALVE CONNECTIONS:

A. Provide valves suitable to connect to adjoining piping as specified for pipe joints. Use pipe size valves.

B. Thread pipe sizes 2-1/2 inches and smaller.

C. Flange pipe or grooved pipe sizes 3 inches and larger.

D. Solder or screw to solder adapters for copper tubing.

2.11 GATE VALVES:

A. Bronze, rising stem, inside screw, solid wedge, solder or screwed ends. Crane 431 or Crane 1334.

B. Iron body, bronze trim, rising stem, OS. & Y., solid wedge, flanged ends. Crane 465-1/2.

2.12 GLOBE OR ANGLE VALVES:

A. Bronze, rising stem, inside screw, renewable disc, solder or screwed ends. Globe: Crane 1 or Crane 1310. Angle: Crane 2.

B. Iron body, bronze trim, rising stem, O.S. & Y., renewable composition disc, flanged ends. Globe:

Crane 351. Angle: Crane 353.

2.13 CHECK VALVES:

A. Bronze, swing disc, solder or screwed ends. Crane 37 or Crane 1342.

B. Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends. Crane 373.

C. Iron body, bronze trim, spring loaded, renewable composition disc, flanged ends. Nibco #F-910 or W-910.

D. PPS coated ductile iron body, aluminum bronze non-slam tilting disc, Victaulic 716.

2.14 BUTTERFLY VALVES IN WATER SYSTEMS ONLY:

A. Body shall be lug type, not wafer type.

B. The valves shall have bronze discs with one piece 316SS stem with three stem bearings.

C. Seat shall be EPDM material and shall be cartridge type with built-in "O" type seal.

D. Grooved end shall be used in lieu of lug type, PPS coated ductile iron body ASTM-A-536, Grade 65-45-12

2.15 BOILER DRAIN VALVES:

A. Bronze compression stop with hose thread. Nibco #73.

2.16 PRESSURE RATINGS:

A. Unless otherwise indicated, use valves suitable for 125 minimum psig WSP and 450°F and 200 psig and 250°F.

2.17 VALVE OPERATORS:

A. Provide suitable hand wheels for gate, globe and drain valves, and inside hose bibbs.

B. Provide one plug cock wrench for every ten plug cocks sized 2 inches and smaller, minimum of one. Provide each plug cock sized 1-1/2 inches and larger with a wrench, with set screw.

C. Provide valves located more than 7 feet from floor in equipment room areas with chain operated sheaves. Extend chains to about 5 feet above floor and hook to clips arranged to clear walking aisles.

2.18 BACKFLOW PREVENTOR:

A. Provide a backflow preventor equal to line size Febco Model 825Y at the hydronic system fill station.

2.19 CLOSED SYSTEM CHEMICAL TREATMENT

A. Provide a 1-year supply of a nitrate-borate (non-chromate) inhibitor sufficient to maintain a nitrite level in excess of 400 ppm.

B. The corrosion inhibitor and clean-out procedure shall be adequate to keep the system water clear and free of suspended corrosion products visible to the eye, and the corrosion rate below 3 miles per year. Inhibitor shall be compatible with glycol solution.

2.20 GLYCOL SOLUTION

A. In the chilled and heating water systems, provide propylene glycol with solution inhibitors equal to that manufactured by Eastman Chemical Company, Kingsport, TN. Provide freeze protection to minus 20°F.

B. Chemical used and procedure for freeze protection and cleaning of piping shall meet all requirements of State Department of Environmental Conservation and the State Board of Health.

C. Furnish and install an automatic glycol feeder. System shall be manufactured by Morr or equal and shall include solid state electronics, pressure gauges, low level pump cut-off, pre-flumed flow assembly, pressure relief valve, positive displacement pump mounted on a primed and painted steel frame with 50 gallon P.E. tank. Unit controller shall be in NEMA 1 steel enclosure.

2.21 TESTING EQUIPMENT

A. Contractor shall furnish a metal cabinet to be wall-mounted with burettes for P and M alkalinity, chloride, sulfate with Taylor comparator for phosphate and/or pH, and Myron-L dissolved solids meter Model 532 MTI with 3 ranges 0-50,-500, -5,000 micromhos and appropriate closed system and tower inhibitor tests.

B. Four copies of testing instructions and log pads shall be furnished in addition to having the water treatment specialist instruct the Owner's personnel in all procedures and tests.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Install all items in accordance with Manufacturer's recommendations.

3.02 PREPARATION AND PAINTING

A. Ream pipes and tubes. Clean off scale and dirt, inside and outside, before assembly. Remove welding slag or other foreign material from piping.

B. Paint all piping with color as directed by Owner. All paint, preparation, etc. shall be as indicated in Section 09900 Painting.

3.03 CONNECTION:

A. Screw joint steel piping up to and including 2-1/2 inch. Weld piping 3 inch and larger, including branch connections.

B. Make screwed joints with full cut standard taper pipe threads with red lead and linseed oil or other approved non-toxic joint compound applied to make threads only.

C. Use main sized saddle type branch connections for directly connecting branch lines to mains in steel piping if main is at least one pipe size larger than the branch for up to 6 inch mains and if main is at least two pipe sizes larger than branch for 8 inch and larger mains. Do not project branch pipes inside the main pipe.

D. Provide non-conducting type connections wherever jointing dissimilar metals in open systems. Brass adapters and valves are acceptable.

3.04 UNDERGROUND PIPE PROTECTION:

A. All underground black steel pipes shall be factory coated with scotch coat or bitumastic and wrapped with plastic/bitumastic tape.

B. All pipe joints and fittings shall be field coated with bitumastic to the same thickness as the pipe coating and wrapped with plastic/bitumastic tape.

C. All underground black steel pipes shall be protected by ten (10) pound magnesium anodes. Provide one anode at each point where pipe enters or leaves the ground and at 100 foot intervals or as shown on plans. Anode lead wires shall be #12 TW copper attached to the pipe by thermo-weld or Cadweld process. Anodes shall be buried a minimum of two (2) feet below pipe or five (5) feet below finished grade, whichever is greater.

D. On exterior wall of building at service entrance, provide a test station mounted eighteen (18) inches above finished grade per detail on plans.

E. Where shown on plans provide pre-insulated piping system with insulation and factory applied jacket. Install and seal all joints per manufacturer recommendations.

3.05 ROUTE AND GRADES:

A. Route piping in orderly manner and maintain proper grades. Install to conserve headroom and interfere as little as possible with use of space. Run exposed piping parallel to walls. Group piping whenever practical at common elevations. Install concealed pipes close to building structure to keep furring to a minimum.

B. Slope water piping 1 inch in 40 feet and arrange to drain at low points.

C. On closed systems, equip low points with 3/4 inch drain valves and hose nipples. Provide, at high points, collecting chambers and manual air vents.

D. Make reductions in piping with eccentric reducing fittings installed to provide drainage and venting.

E. Install piping to allow for expansion and contraction without stressing pipe or equipment connected.

F. Provide clearance for installation of insulation and for access to valves, air vents, drains and unions.

3.06 AIR VENTS:

A. Where large air quantities can accumulate, provide 1/2" Crane #801 and faucet, and 1/2" copper tubing in lieu of 1/4" pet cock and tubing.

B. For float type air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

3.07 RELIEF VALVES:

A. Pipe relief valve outlet to nearest floor drain.

B. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

3.08 VALVES:

A. Install valves with stems upright or horizontal, not inverted.

B. Install gate valves for shut-off and isolating service, to isolate equipment, part of systems or vertical

risers.

C. Install globe valves for throttling service and control device or meter by-pass.

D. Provide spring loaded check valves on discharge of heating, chilled, and condenser water pumps.

E. Provide drain valves at main shut-off valves, low points of piping and apparatus.

3.09 PUMPS:

A. Provide drains for bases and stuffing boxes piping to and discharging into floor drains.

B. Provide air cock and drain connection on horizontal pump casings.

C. Provide gate valve and line sized suction diffuser with strainer on suction and line sized soft seated check valve, globe valve, and gate valve on discharge. A triple duty valve along with a gate or butterfly valve for isolation is also approved on discharge.

D. If suction diffuser with strainer is used, a separate strainer is not required. Provide a fine start-up strainer, and replace it with final strainer after 24 hours of system operation.

E. Decrease from line size, with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and over.

F. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25% of midpoint of published maximum efficiency curve.

G. Qualified millwright to check, align, and certify base mounted pumps prior to start-up.

3.10 GLYCOL SOLUTION

A. Provide sufficient quantity of propylene glycol solution for initial fill of system to level indicated on plans. Mix solution per manufacturer's recommendations. Provide necessary testing equipment for monitoring solution concentration and training before Owner's personnel. Clean and test system prior to adding glycol solution.

3.11 TESTING:

A. Test all chilled and heating water piping systems to assure their being absolutely tight. In the case of pipes which are to be insulated, tests shall be completed and the piping system proved to be absolutely tight before any insulation is applied. Wherever pipes are placed so that they will ultimately be concealed, these tests shall be conducted and the absolute tightness of each piping system shall be demonstrated before that system is concealed so as to be inaccessible.

B. Test Method: Impose on piping system a hydrostatic pressure of 150 psig for a period no less than eight hours. During this test period, all pipe, fittings, and accessories in the particular piping shall be carefully inspected and any leaks shall be stopped.

C. Wherever conditions permit, each piping system shall thereafter be subjected to its normal operating pressure and temperature for a period of no less than twenty-four hours. During that period, it shall

be kept under the careful observation of the contractor.

D. The piping systems must demonstrate the propriety of their installation by remaining absolutely tight during this period. The satisfactory completion of any test or series of tests shall not relieve the contractor of any responsibility with regard to the ultimate proper and satisfactory operation of such piping systems and their accessories.

E. Cleaning of HVAC piping system:

1. After completion of the water circulating systems, they shall be thoroughly cleaned of scale, grease and other foreign matter with solutions as directed by a water treatment consultant employed by the contractor.
2. The cleaning of the water circuits shall consist of alternate filling, circulating, and draining until accumulations of foreign matter disappear.
3. The cleaning solution shall be trisodium phosphate or suitable alternative and water, concentration as recommended by the chemical manufacturers for this duty. This solution shall be pumped through the piping at such a rate as to remove oil, mill scale, etc.; discard and drain. Repeat this operation twice. At the end of the second flushing period, check PH of water in system (litmus paper) and if not neutral, repeat flushing or neutralize with appropriate chemical. Building circulating water pumps may be used for pumping the cleaning solution if the mechanical seals are replaced after the cleaning operation.
4. Add a corrosion inhibitor to the system as soon as possible following the clean out procedure. Inhibitor shall be compatible with glycol solution.

F. In case of defects, they shall be made good to the satisfaction of the engineer/architect and the work retested without delay. Such work shall be done without additional charge.

G. Give engineer two days' notice before tests are made. Do not draw water off the pipe or cover pipes until examined by engineer or architect's representative. Acceptance of tests does not imply the acceptance of piping layout or practices contrary to the plans and specifications.

3.12 WATER SYSTEMS BALANCE:

A. The contractor shall prepare the water systems for balancing in the following manner. All balancing shall be performed with glycol solution in system.

1. Open all valves to full open position. Close coil bypass stop valves. Set mixing valve to full coil flow.
2. Remove and clean all strainers.
3. Examine water in system and determine if water has been treated and cleaned.
4. Check pump rotation.
5. Check expansion tanks to determine they are not air bound and the system is completely full of water.
6. Check all air vents at high points of water systems and determine all are installed and operating freely.
7. Set all temperature controls so all coils are calling for full cooling. This should close all automatic bypass valves at coil and chillers. Same procedure when balancing hot water coils, set on full call for heating.
8. Check operation of automatic bypass valves.
9. Check and set operating temperatures of boilers and chillers to design requirements.
10. Complete air balance must have been accomplished before actual water balance begins.

B. Test and Balance Procedure - Phase Two:

1. Set chilled water, hot water, and condenser water pumps to proper gallons per minute delivery.
2. Adjust water flow of chilled water through chillers. Adjust water flow of condenser water

through condensers and towers.
3. Adjust water flow of hot water through boilers (if required).
4. Check leaving water temperatures and return water temperatures through chillers and convertors. Reset to correct design temperatures.
5. Check water temperatures at inlet side of cooling and heating coils. Note rise or drop of temperatures from source.
6. Proceed to balance each chilled water coil and hot water coil.
7. Upon completion of flow readings and adjustments at coils, mark all settings and record data.

C. Test and Balance Procedure - Phase Three: Upon completion of Phase 1 & 2, the Contractor shall proceed with Phase 3 as follows:

1. After adjustments to coils are made, recheck settings at the pumps, chillers, boilers, and towers and readjust if required.
2. Install pressure gauges on coil. Read pressure drop through coil at set flow rates on call for full cooling and on full heating. Set pressure drop across bypass valve to match coil full flow pressure drop. This prevents unbalanced flow conditions when coils are on full bypass.
3. Same procedure on chillers to adjust chiller bypass valves. Same procedure on cooling towers to adjust spray nozzles.
4. Record and check the following items at each cooling and heating element.
5. Inlet water temperatures.
6. Leaving water temperatures.
7. Pressure drop of each coil.
8. Pressure drop across bypass valve.
9. Pump operating suction and discharge pressure and final T.D.H.
10. List all mechanical specifications of pumps.
11. Rated and actual running amperage of pump motor.
12. Water metering device readings.

Upon completion of Phase Three, all information shall be inserted on a sheet listing all items required by specifications and be included in complete test and balance report. All sheets shall be neatly typed.

3.13 WATER TREATMENT

A. Provide sufficient quantity of treatment for initial start-up of system and 180 days operation. Provide necessary monitoring equipment and provide training for Owner's personnel.

END OF SECTION

HYDRONIC SYSTEM ACCESSORIES
SECTION 15512

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. Condenser water system - above ground.

B. All associated fittings and other accessories

C. Pumps

D. Valves

E. Air separators

F. Expansion tanks

G. Backflow preventor

1.02 RELATED WORK:

A. Section 09900 Painting

B. Section 15250 Mechanical Insulation

C. Section 15748 Geothermal Heat Pump Condenser Water Pipe

D. Section 15749 Standing Column Vertical Heat Exchanger Wells

1.03 QUALITY ASSURANCE:

A. Welding materials and labor to conform to ASME Code and applicable state Labor Regulations.

B. Use welders fully qualified and licensed by state authorities.

1.04 SHOP DRAWINGS:

A. Submit actual performance data on all equipment and accessories contained within this section.

B. Prepare submittals in accordance with Section 15010 -- General Mechanical Requirements.

C. Provide shop drawings drawn to scale and showing sizes and location of all piping, equipment and accessories. There shall be approved by the engineer prior to ordering, shipping, fabricating or installation of any components.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Pumps and System Accessories:

1. Amtrol
2. Bell & Gossett
3. Armstrong
4. Aurora

B. Valves:

1. Nibco
2. Crane
3. Milwaukee
4. Jenkins
5. Nordstrom

2.02 PIPE AND FITTINGS:

A. Piping:

Service	Material
Condenser Water above ground	High density polyethylene or Type "L" hard copper (Ref. Para. 3.03 this Section)
Equipment Drains and Overflows	Schedule 40, PVC or Type "L" Hard Copper

B. Fittings:

Service	Material	Joint
Condenser Water	HDPE Copper	Heat Fused sweat solder joint or Silfoss .

C. There shall be no galvanized or steel piping, fittings or accessories on this project.

2.03 UNIONS AND COUPLINGS:

A. Size 2-1/2 inch and under: All bronze for copper piping.

B. Size 3 inch and over: 150 psi forged steel slip-on flanges for ferrous piping, 150 psi bronze flanges for copper piping. Gaskets: 1/16-inch thick preformed synthetic rubber bonded asbestos.

C. Use grooved mechanical couplings to engage and lock grooved or shouldered pipe ends and to allow for some angular deflection, contraction and expansion. Couplings consist of malleable iron housing-clamps, C-shaped composition sealing gasket and steel bolts.

2.04 STRAINERS:

A. Size 2-1/2 inch and under: Screwed, iron body, Y pattern with 1/32 inch stainless steel perforated screen.

B. Size 3 inch to 4 inch: Flanged iron body, Y pattern with 3/64 inch stainless steel perforated screen.

C. Size 5 inch and larger: Flanged iron body, basket pattern with 1/8-inch stainless steel perforated screen.

D. Screen free area minimum three times area of inlet pipe. Provide valved drain and hose connection off strainer bottom.

2.05 EXPANSION TANK:

A. Use pressurized, bladder type equal to AMTROL Model AX. See plans for size.

2.06 AIR SEPARATORS:

A. Straight type equal to Wheatly AS-0400

B. Provide on suction side of system circulation pump with AMTROL #720 air elimination valve.

2.07 MANUAL AIR VENTS:

A. Construct manual air vents from 1/4" Crane #702 pet cock and a 2 foot length of 1/4" copper tube.

B. Connect pet cock to all high points in piping system. Connect 2 foot length of 1/4" copper tubing to outlet of pet cock and coil above ceiling.

2.08 RELIEF VALVES:

A. ASME rated direct spring loaded type, lever operated, non-adjustable factory set discharge pressure.

B. Provide relief valves on pressure tanks, low pressure side of reducing valves, heating converters, and expansion tanks.

C. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

2.09 PUMPS:

A. Primary system pumps shall be equipped with mechanical seals, open drip-proof motor with maximum speed of 1750 rpm. Pumps shall be centrifugal, single stage, with cast iron casing, steel shaft, bronze fitted, and furnished with auxiliary pan.

2.10 VALVE CONNECTIONS:

A. Provide valves suitable to connect to adjoining piping as specified for pipe joints. Use pipe size valves.

B. Thread pipe sizes 2-1/2 inches and smaller.

C. Flange pipe sizes 3 inches and larger.

D. Solder or screw to solder adaptors for copper tubing.

2.11 GATE VALVES:

A. Bronze, rising stem, inside screw, solid wedge, solder or screwed ends. Crane 431 or Crane 1334.

B. Iron body, bronze trim, rising stem, OS. & Y., solid wedge, flanged ends. Crane 465-1/2.

2.12 GLOBE OR ANGLE VALVES:

A. Bronze, rising stem, inside screw, renewable disc, solder or screwed ends. Globe: Crane 1 or Crane 1310. Angle: Crane 2.

B. Globe: Crane 351. Angle: Crane 353.

2.13 CHECK VALVES:

A. Bronze, swing disc, solder or screwed ends. Crane 37 or Crane 1342.

B. Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends. Crane 373.

C. Iron body, bronze trim, spring loaded, renewable composition disc, flanged ends. Nibco #F-910 or W-910.

2.14 BUTTERFLY VALVES IN WATER SYSTEMS ONLY:

A. Body shall be lug type, not wafer type.

B. The valves shall have bronze discs with one piece 316SS stem with three stem bearings.

C. Seat shall be EPDM material and shall be cartridge type with built-in "O" type seal.

2.15 BOILER DRAIN VALVES:

A. Bronze compression stop with hose thread. Nibco #73.

2.16 PRESSURE RATINGS:

A. Unless otherwise indicated, use valves suitable for 125 minimum psig WSP and 450°F and 200 psig and 250°F.

2.17 VALVE OPERATORS:

A. Provide suitable handwheels for gate, globe and drain valves, and inside hose bibbs.

B. Provide one plug cock wrench for every ten plug cocks sized 2 inches and smaller, minimum of one. Provide each plug cock sized 1-1/2 inches and larger with a wrench, with set screw.

C. Provide valves located more than 7 feet from floor in equipment room areas with chain operated sheaves. Extend chains to about 5 feet above floor and hook to clips arranged to clear walking aisles.

2.18 BACKFLOW PREVENTOR:

A. Provide a backflow preventor equal to line size Febco Model 825Y at the hydronic system fill station.

2.19 WATER TREATMENT

A. Provide water treatment for mechanical draft closed circuit evaporative cooler open sump to control corrosion, scale and sludge. System shall be complete with automatic injector. Treatment shall be equal to Kernote KCT II.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Install all items in accordance with Manufacturer's recommendations.

3.02 PREPARATION AND PAINTING

A. Ream pipes and tubes. Clean off scale and dirt, inside and outside, before assembly. Remove welding slag or other foreign material from piping.

B. Paint all piping with color as directed by Owner. All paint, preparation, etc. shall be as indicated in Section 09900 Painting.

3.03 CONNECTION:

A. Screw joint steel piping up to and including 2-1/2 inch. Weld piping 3 inch and larger, including branch connections.

B. Make screwed joints with full cut standard taper pipe threads with red lead and linseed oil or other approved non-toxic joint compound applied to make threads only.

C. Use main sized saddle type branch connections for directly connecting branch lines to mains in steel piping if main is at least one pipe size larger than the branch for up to 6 inch mains and if main is at least two pipe sizes larger than branch for 8 inch and larger mains. Do not project branch pipes inside the main pipe.

D. Provide non-conducting type connections wherever jointing dissimilar metals in open systems. Brass adaptors and valves are acceptable.

3.04 UNDERGROUND PIPE PROTECTION:

A. All underground black steel pipes shall be factory coated with scotch coat or bitumastic and wrapped with plastic/bitumastic tape.

B. All pipe joints and fittings shall be field coated with bitumastic to the same thickness as the pipe coating and wrapped with plastic/bitumastic tape.

C. All underground black steel pipes shall be protected by ten (10) pound magnesium anodes. Provide one anode at each point where pipe enters or leaves the ground and at 100 foot intervals or as shown on plans. Anode lead wires shall be #12 TW copper attached to the pipe by thermo-weld or Cadweld process. Anodes shall be buried a minimum of two (2) feet below pipe or five (5) feet below finished grade, whichever is greater.

D. On exterior wall of building at service entrance, provide a test station mounted eighteen (18) inches above finished grade per detail on plans.

3.05 ROUTE AND GRADES:

A. Route piping in orderly manner and maintain proper grades. Install to conserve headroom and interfere as little as possible with use of space. Run exposed piping parallel to walls. Group piping whenever practical at common elevations. Install concealed pipes close to building structure to keep furring to a minimum.

B. Slope water piping 1 inch in 40 feet and arrange to drain at low points.

C. On closed systems, equip low points with 3/4 inch drain valves and hose nipples. Provide, at high points, collecting chambers and manual air vents.

D. Make reductions in piping with eccentric reducing fittings installed to provide drainage and venting.

E. Install piping to allow for expansion and contraction without stressing pipe or equipment connected.

F. Provide clearance for installation of insulation and for access to valves, air vents, drains and unions.

3.06 AIR VENTS:

A. Where large air quantities can accumulate, provide 1/2" Crane #801 and faucet, and 1/2" copper tubing in lieu of 1/4" pet cock and tubing.

B. For float type air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

3.07 RELIEF VALVES:

A. Pipe relief valve outlet to nearest floor drain.

B. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

3.08 VALVES:

A. Install valves with stems upright or horizontal, not inverted.

B. Install gate valves for shut-off and isolating service, to isolate equipment, part of systems or vertical risers.

C. Install globe valves for throttling service and control device or meter by-pass.

D. Provide spring loaded check valves on discharge of heating, chilled, and condenser water pumps.

E. Provide drain valves at main shut-off valves, low points of piping and apparatus.

3.09 PUMPS:

A. Provide drains for bases and stuffing boxes piping to and discharging into floor drains.

B. Provide air cock and drain connection on horizontal pump casings.

C. Provide gate valve and line sized suction diffuser with strainer on suction and line sized soft seated check valve, globe valve, and gate valve on discharge. A triple duty valve along with a gate or butterfly valve for isolation is also approved on discharge.

D. If suction diffuser with strainer is used, a separate strainer is not required. Provide a fine start-up strainer, and replace it with final strainer after 24 hours of system operation.

E. Decrease from line size, with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and over.

F. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25% of midpoint of published maximum efficiency curve.

G. Qualified millwright to check, align, and certify base mounted pumps prior to start-up.

3.10 TESTING:

A. Test all chilled, hot water, chilled-hot water, and condenser water piping systems to assure their being absolutely tight. In the case of pipes which are to be insulated, tests shall be completed and the piping system proved to be absolutely tight before any insulation is applied. Wherever pipes are placed so that they will ultimately be concealed, these tests shall be conducted and the absolute tightness of each piping system shall be demonstrated before that system is concealed so as to be inaccessible.

B. Test Method: Impose on piping system a hydrostatic pressure of 150 psig for a period no less than eight hours. During this test period, all pipe, fittings, and accessories in the particular piping shall be carefully inspected and any leaks shall be stopped.

C. Wherever conditions permit, each piping system shall thereafter be subjected to its normal operating pressure and temperature for a period of no less than twenty-four hours. During that period, it shall be kept under the careful observation of the contractor.

D. The piping systems must demonstrate the propriety of their installation by remaining absolutely tight during this period. The satisfactory completion of any test or series of tests shall not relieve the contractor of any responsibility with regard to the ultimate proper and satisfactory operation of such piping systems and their accessories.

E. Cleaning of HVAC piping system:

1. After completion of the water circulating systems, they shall be thoroughly cleaned of scale, grease and other foreign matter with solutions as directed by a water treatment consultant employed by the contractor.
2. The cleaning of the water circuits shall consist of alternate filling, circulating, and draining until accumulations of foreign matter disappear.
3. The cleaning solution shall be trisodium phosphate or suitable alternative and water, concentration as recommended by the chemical manufacturers for this duty. This solution shall be pumped through the piping at such a rate as to remove oil, mill scale, etc.; discard and drain. Repeat this operation twice. At the end of the second flushing period, check PH of water in system (litmus paper) and if not neutral, repeat flushing or neutralize with appropriate chemical. Building circulating water pumps may be used for pumping the cleaning solution if the mechanical seals are replaced after the cleaning operation.

F. In case of defects, they shall be made good to the satisfaction of the engineer/architect and the work retested without delay. Such work shall be done without additional charge.

G. Give engineer two days' notice before tests are made. Do not draw water off the pipe or cover pipes until examined by engineer or architect's representative. Acceptance of tests does not imply the acceptance of piping layout or practices contrary to the plans and specifications.

3.11 CONDENSER WATER SYSTEMS BALANCE:

A. The contractor shall prepare the water systems for balancing in the following manner. All balancing shall be performed with glycol solution in system.

1. Open all valves to full open position. Close coil bypass stop valves. Set mixing valve to full coil flow.
2. Remove and clean all strainers.
3. Examine water in system and determine if water has been treated and cleaned.
4. Check pump rotation.
5. Check expansion tanks to determine they are not air bound and the system is completely full of water.
6. Check all air vents at high points of water systems and determine all are installed and operating freely.
7. Set all temperature controls so all coils are calling for full cooling. This should close all automatic bypass valves at coil and chillers. Same procedure when balancing hot water coils, set on full call for heating.
8. Check operation of automatic bypass valves.
9. Check and set operating temperatures of boilers and chillers to design requirements.
10. Complete air balance must have been accomplished before actual water balance begins.

B. Test and Balance Procedure - Phase Two:

1. Set chilled water, hot water, and condenser water pumps to proper gallons per minute delivery.
2. Adjust water flow of chilled water through chillers. Adjust water flow of condenser water through condensers and towers.
3. Adjust water flow of hot water through boilers (if required).
4. Check leaving water temperatures and return water temperatures through chillers and convertors. Reset to correct design temperatures.
5. Check water temperatures at inlet side of cooling and heating coils. Note rise or drop of temperatures from source.
6. Proceed to balance each chilled water coil and hot water coil.
7. Upon completion of flow readings and adjustments at coils, mark all settings and record data.

C. Test and Balance Procedure - Phase Three: Upon completion of Phase 1 & 2, the Contractor shall proceed with Phase 3 as follows:

1. After adjustments to coils are made, recheck settings at the pumps, chillers, boilers, and towers and readjust if required.
2. Install pressure gauges on coil. Read pressure drop through coil at set flow rates on call for full cooling and on full heating. Set pressure drop across bypass valve to match coil full flow pressure drop. This prevents unbalanced flow conditions when coils are on full bypass.
3. Same procedure on chillers to adjust chiller bypass valves. Same procedure on cooling towers to adjust spray nozzles.
4. Record and check the following items at each cooling and heating element.
5. Inlet water temperatures.
6. Leaving water temperatures.
7. Pressure drop of each coil.
8. Pressure drop across bypass valve.
9. Pump operating suction and discharge pressure and final T.D.H.
10. List all mechanical specifications of pumps.
11. Rated and actual running amperage of pump motor.
12. Water metering device readings.

Upon completion of Phase Three, all information shall be inserted on a sheet listing all items required by specifications and be included in complete test and balance report. All sheets shall be neatly typed.

3.12 WATER TREATMENT

A. Provide sufficient quantity of treatment for initial start-up of system and 180 days operation. Provide necessary monitoring equipment and provide training for Owner's personnel.

END OF SECTION

BOILER- COMMERCIAL FIRE TUBE HOT WATER CONDENSING
SECTION 15551

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. Boilers

B. Controls and boiler trim

C. Indoor-outdoor controller

D. Hot water connections

E. Fuel connections

F. Interface with BAS

G. Flue connection

1.02 RELATED WORK:

A. Section 15510 Hydronic System

B. Section 15510 Hydronic System Accessories

1.03 QUALITY ASSURANCE:

A. Comply with Applicable Regulations and shall meet A.S.M.E. and pressure vessel codes.

B. Units approved and labeled by Underwriter's Laboratories.

1.04 REFERENCE STANDARDS:

A. Provide factory tests to check construction, controls and operation of unit.

B. Provide authorized boiler inspection prior to shipment and submit copy of inspection report to Engineer.

C. Boilers to be guaranteed to operate at minimum efficiency of 92%.

D. Boilers shall meet or exceed ASHRAE Standard 90.

1.05 SUBMITTALS:

A. Manufacturer's descriptive literature, operating instructions, maintenance and repair data.

B. Manufacturer's installation instructions.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturer and type: Raypak or Lochinvar.

B. Substitutions: Items of same function and performance are acceptable in conformance with Section 15010.

2.02 GENERAL:

A. Provide factory assembled, factory fire-tested, self-contained, readily transported unit ready for operation except for connection of water, fuel, electronic controls, and vent services.

B. Mount on 4" concrete housekeeping pad and have forced draft burner, burner controls, boiler trim, and temperature limiting device.

2.03 CONSTRUCTION:

A. The BOILER shall bear the ASME "H" stamp for 160 psi working pressure and shall be National Board listed. The boiler shall have a fully welded 316L stainless steel, fire tube heat exchanger. There shall be a single pressure vessel. Multiple pressure vessels are not acceptable. Fire Tube shall be of the Wave Fire Tube design and capable of transferring16,000 to 20,000 Btu's per tube. A liquid impact die shall be used to form the Wave Fire Tube. There shall be no banding material, bolts, gaskets or "O" rings in the heat exchanger construction. The Wave Fire Tube shall be robotically welded to the tube sheets. The heat exchanger shall be designed for a single-pass water flow to limit the water side pressure drop. Pressure drop shall be no greater than 3.2 psi at 180 gpm. The condensate collection basin shall be constructed of welded 316L stainless steel. The complete heat exchanger assembly shall carry a ten (10) year limited warranty.

B. The BOILER shall be certified and listed by C.S.A. International under the latest edition of the harmonized ANSI Z21.13 test standard for the U.S. and Canada. The BOILER shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard and the minimum efficiency requirements of the latest edition of the AHRI BTS-2000 Standard as defined by the Department of Energy in 10 CFR Part 431. The BOILER shall operate at a minimum of 92% thermal efficiency at full fire as registered with AHRI. The registered combustion efficiency must be equal or greater than the registered thermal efficiency. All models shall operate up to 98% thermal efficiency with return water temperatures at 70°F or below at 20°F temperature rise. The BOILER shall be certified for indoor installation.

C. The BOILER shall be constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal. Two burner/flame observation ports shall be provided. The single burner shall be a premix design constructed of high temperature stainless steel with a woven Fecralloy outer covering to provide modulating firing rates. The BOILER shall be supplied with two gas valves designed with negative pressure regulation and be equipped with a pulse width modulation blower system, to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency. The BOILER shall operate in a safe condition with gas supply pressures as low as 4 inches of water column. The burner flame shall be ignited by direct spark ignition with flame monitoring via a flame sensor.

D. The BOILER shall be installed and vented with a Direct Vent system with vertical roof top termination of both the exhaust vent and combustion air. The flue shall be Category IV approved Stainless Steel sealed vent material terminating at the rooftop with the manufacturer's specified vent termination. A separate pipe shall supply combustion air directly to the boiler from the outside. The air inlet pipe must be sealed and may be other materials listed in the Installation manual. The boiler's total combined air

intake length shall not exceed 100 equivalent feet. The boiler's total combined exhaust venting length shall not exceed 100 equivalent feet. The air inlet must terminate on the rooftop with the exhaust.

E. The BOILER shall operate at altitudes up to 4,500 feet above sea level without additional parts or adjustments. High altitude operation shall be certified at a minimum of 4,500 feet above sea level by a 3rd party organization.

F. The BOILER shall be suitable for use with polypropylene glycol, up to 50% concentration. The de-rate associated with the glycol will vary per glycol manufacturer.

2.04 BOILER TRIM

A. The BOILER shall utilize a 24 VAC control circuit and components. The control system shall have a display for boiler set-up, boiler status, and boiler diagnostics. All components shall be easily accessed and serviceable from the front and top of the jacket. The BOILER shall be equipped with a temperature/pressure gauge; high limit temperature control with manual reset; ASME certified pressure relief valve set for 75 psi; outlet water temperature sensor (dual thermistor); return water temperature sensor; outdoor air sensor, flue temperature sensor (dual thermistor); high and low gas pressure switches, low water cut off with manual reset, blocked drain switch and a condensate trap for the heat exchanger condensate drain.

2.05 ELECTRONIC BOILER MANAGEMENT SYSTEM:

A. The BOILER shall feature the "SMART TOUCH™" control with CON-X-US which is standard and factory installed with an 8" liquid crystal touch screen display, password security, outdoor air reset, pump delay with freeze protection, pump exercise, ramp delay featuring six steps, domestic hot water prioritization with limiting capabilities and PC port connection. A secondary control that is field mounted outside or inside the appliance is not acceptable. The BOILER shall have alarm contacts for any failure, runtime contacts and data logging of runtime at given modulation rates, ignition attempts and ignition failures. The BOILER shall have a built-in "Cascade" to sequence and rotate while maintaining modulation of up to eight boilers of different Btu inputs without utilization of an external controller. The internal "Cascade" function shall be capable of lead-lag, efficiency optimization, front-end loading, and rotation of lead boiler every 24 hours. The control must include cascade redundancy to allow a member boiler to become the temporary leader if the original lead boiler shall lose communication with the members. The control must be equipped with standard BACnet MSTP and Modbus communication protocol with a minimum 55 readable points. The BOILER shall have an optional gateway device which will allow integration with Johnson Controls.

B. The "SMART TOUCH™" control shall include CON-X-US communication platform that will allow remote access via a smart phone or Tablet. This will allow the ability to monitor and manage multiple Crest Boilers and send alerts via text or e-mail notifying of changes in system status. A user shall have the ability to check system status or re-program any boiler function remotely.

C. The "SMART TOUCH™" control shall increase fan speed to boost flame signal when a weak flame signal is detected during normal operation. A 0 -10 VDC output signal shall control a variable speed boiler pump (pump to be offered by manufacturer) to keep a fixed delta t across the boiler regardless of the modulation rate. The BOILER shall have the capability to receive a 0 – 10 VDC input signal from a variable speed system pump to anticipate changes in system heat load in order to prevent flow related issues and erratic temperature cycling. The variable speed pump shall be provided with the boiler.

D. The BOILER shall be equipped with two terminal strips for electrical connection. A low voltage

connection board with 30 data points for safety and operating controls, i.e., Alarm Contacts, Runtime Contacts, Louver Proving Switch, Tank Thermostat, Remote Enable/Disable, System Supply Sensor, Outdoor Sensor, Tank Sensor, Modbus Building Management System signal and Cascade control circuit. A high voltage terminal strip shall be provided for Supply voltage. Supply voltage shall be 120 volt / 60 hertz / single phase. The high voltage terminal strip plus integral relays are provided for independent pump control of the System pump, the Boiler pump and the Domestic Hot Water pump.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Complete structural, mechanical, and electrical connections in accordance with manufacturer's installation instructions.

B. Provide factory start-up service, make adjustments and efficiency tests.

END OF SECTION

GENERAL ELECTRICAL REQUIREMENTS
SECTION 16010

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Comply with the Conditions of the Contract, General and Supplementary Conditions, and any other applicable requirements contained herein or issued under separate cover.

B. Perform other work related to or necessary for the electrical installation in accordance with the applicable Specification Division or Section contained herein.

C. In Electrical Specification Sections, items under "RELATED WORK" are listed for convenience only and are not guaranteed to be a complete listing of all applicable work.

1.02 CODES, REGULATIONS, AND STANDARDS:

A. Comply with the latest edition of applicable codes including the following:

1. International Building Code
2. Life Safety Code (NFPA 101)
3. National Electrical Code NEC (NFPA 70)
4. State Fire Prevention Code

B. Comply with applicable Regulations as amended, including the following:

1. State Department of Health Regulations
2. Rules and Regulations for Energy Efficiency Standards for New Building Construction
3. State and Federal Department of Labor Regulations
4. Occupational Safety and Health Act (OSHA)
5. Utility Company Regulations and Requirements
6. Other State and Federal Laws and Regulations
7. Local Ordinances
8. State Department of Education Minimum Schoolhouse Construction Standards

C. Furnish products and perform installation conforming to the latest accepted Standards published by the following organizations:

1. Underwriter's Laboratories, Inc. (UL)
2. National Fire Protection Association (NFPA)
3. National Electrical Manufacturer's Association (NEMA)
4. American Society of Testing Materials (ASTM)
5. American National Standards Institute (ANSI)
6. Institute of Electrical and Electronic Engineers (IEEE)
7. Insulated Power Cable Engineer's Association (IPCEA)
8. Certified Ballast Manufacturer (CBM)
9. Electrical Testing Laboratories (ETL)
10. Illuminating Engineering Society (IES)
11. Insurance Service Office (ISO)
12. Factory Insurance Association (FIA)
13. Factory Mutual (FM)
14. National Sanitation Foundation (NSF)
15. Electronic Industry Association/Telecommunications Industry Association (EIA/TIA)

D. In case of discrepancy or conflict between Codes, Regulations, Standards, Drawings and/or Specifications, the requirement yielding the higher(est) quality of work shall govern.

1.03 PERMITS AND ADMINISTRATIVE FEES:

A. Obtain and maintain all necessary licenses, permits and inspection certificates and pay all fees including connection fees, taxes and penalties, if any, required by the Administrative Authority. Refundable deposits will be paid by the Owner.

1.04 PRE-CONSTRUCTION SUBMITTALS:

A. Refer to each Electrical Section for a listing of required Submittals under that Section. Refer to Section entitled Shop Drawings, Product Data, and Samples for submittal procedure and requirements.

B. Submit for approval, Manufacturer's technical data sheets including performance specifications for all equipment, major materials, and other manufactured items. Obtain approval on product manufacturers not specifically named prior to making submittals.

C. Submit for approval, Contractor's original Shop Drawings of all assemblies of manufactured items including complete wiring diagrams. Indicate all pertinent dimensions on scale drawings necessary for clarity and for coordination of the installation between trades.

D. Submit for approval, a schedule of nameplates and test report forms.

E. Bind Submittals in durable cover(s) with contents conveniently organized and properly indexed.

F. Make Submittals on all work contained in Division 16, Electrical, at one time except by special permission.

1.05 NOT USED

1.06 INTENT:

A. It is intended that the Contractor provide a complete and operating electrical system including all incidental items and connections necessary for proper operation or customarily included even though each and every item may not be indicated.

B. The Drawings indicate the general layout requirements for equipment, fixtures, conduit, devices, etc. Final layout will be governed by actual field conditions with all measurements verified at the site.

C. Conduit and wiring shown on the Drawings are diagrammatic unless noted otherwise, and are intended to indicate switching and branch circuit arrangements, phase balance, and general wiring connection requirements.

D. It is intended that the electrical installation be safe, reliable, energy efficient, and easily maintained with adequate provisions for access to equipment.

E. It is intended that the electrical system operate quietly with noise levels below the criteria recommended for the application by NEMA. Provide corrective action as required to reduce objectionable hum or vibration. Acoustically insulate between outlet boxes in common wall serving different rooms.

F. The Drawings indicate diagrammatically the number and function of the conductors required for the conduit routing as shown. The Contractor has the option of changing the routing or combining

circuits in one conduit run, providing the installation does not interfere with work of other trades, the system functions as intended, the ampacity of the conductors is derated in accordance with the NEC, and none of the loads require a dedicated circuit or isolated ground. Indicate actual conduit routing and conductor arrangement on record drawings. Neutrals for circuits serving non-linear loads are considered a current carrying conductor.

PART 2 - PRODUCTS

2.01 PRODUCT REQUIREMENTS:

A. Furnish only new standard products of a manufacturer regularly engaged in the production of said products.

B. Support all products by service organizations with adequate spare parts inventory and personnel located reasonably close to the site.

C. Where multiple units of the same type or class of products are required, provide all units of the same manufacturer.

2.02 PRODUCT HANDLING:

A. Store products in the original containers and shelter in a suitable environment at an approved location.

B. Make products readily accessible for inspections and inventory accounting.

2.03 PRODUCT SUBSTITUTIONS:

A. For products specified by generic reference standard, select any product meeting such standard.

B. For products specified by naming one or more products or manufacturers, select any named. Submit request for substitution of any manufacturer not specifically named and obtain approval prior to bidding.

C. Provide all information required to support claim of "equality" of product proposed for substitution. Substitutions will be considered only if equivalent in quality, efficiency, performance, size, weight, reliability, appearance, and ease of maintenance to the specified product or manufacturer.

D. Where approved product substitutions alter the design, space requirements, electrical requirements, connections, cooling loads, or etc., include all work necessary to provide a complete installation of quality equal to or better than that which would have been achieved with products of manufacturers as specified.

2.04 PRODUCT APPLICATION:

A. Furnish products that are UL listed for their intended use and environment. For example, use only rain tight products suitable for wet locations when installed outdoors or where indicated on the Drawings to be weatherproof (WP).

PART 3 - EXECUTION

3.01 MANUFACTURER'S DIRECTIONS:

A. Handle, install, connect, test, and operate all products, assemblies, and systems in accordance with manufacturer's recommendations.

B. In case of conflicting requirements between the manufacturer's directions and the contract documents, obtain instructions before proceeding with the work.

3.02 INSPECTIONS:

A. Arrange with the Administrative Authority for inspections of all work required and obtain approval prior to concealing or proceeding with the work.

B. Give adequate notice before concealing any work for inspections by the Owner's representatives. Obtain instructions to proceed before concealing the work.

3.03 CLEANING:

A. Keep the premises clean and free from debris, dirt, and etc.

B. Upon completion of the work, clean and polish all fixtures, equipment, and etc.

3.04 WORKMANSHIP:

A. No person shall perform electrical work on the contract without possessing a Master or Journeyman License from the State Electrical Examiners Board. All electrical work and apprentice electricians shall be supervised by a Master or Journeyman Electrician on a one to one ratio.

B. Perform all work in accordance with the best practices of the trade and provide a "neat" installation by technicians skilled in their respective trades and properly licensed.

C. Accurately install conduit, and other equipment plumb, level, and true to line with runs parallel or perpendicular to building lines. Make bends or offsets uniform.

D. Carefully perform all cutting, drilling, digging, and etc., and patch or refinish the disturbed area to the condition of adjoining or similar surfaces in an approved manner. Do not cut any structural member without specific approval. Do not cut any electrical or mechanical lines that may be concealed.

E. Conceal conduit in chases, furrings, or above ceilings unless indicated otherwise. Flush mount equipment where shown in finished walls where possible.

3.05 FLAME AND SMOKE CONSIDERATIONS:

A. In ducts or other enclosures used for transporting environmental air, including return air plenums above ceilings, use only products conforming to NFPA and UL composite classifications not exceeding 25 for flame spread and 50 for smoke developed ratings, or install in conduit or approved enclosure. This requirement applies to all materials including signal cable insulation jackets, finishes, and etc.

B. Completely seal penetrations made through fire and/or smoke rated walls, ceilings, floors, or other barriers for the passage of conduit with a UL listed material to preserve the fire/smoke rating of the barrier.

3.06 COORDINATION:

A. Coordinate the electrical work with the work of related trades to avoid interference. Determine the exact route of conduit prior to fabrication and the exact location of each outlet and equipment enclosure prior to installation.

B. Study the Mechanical and Electrical Drawings, and Specifications including Shop Drawings and manufacturer's technical data sheets, and compare to actual site conditions and constraints. In case of conflicts or interference, obtain clarification or instructions before performing any work.

C. Piping or equipment requiring slope or specific mounting elevations will generally have right of way over conduit and other products whose elevations can be changed.

D. Carefully plan the sequence of work as required to minimize disruptions and installation time.

3.07 EQUIPMENT CONNECTIONS:

A. Make all required electrical connections to each item of equipment shown or specified including equipment furnished by Owner, and make operational.

3.08 PROTECTION REQUIREMENTS:

A. Locate existing wiring and adequately identify and protect during the execution of the work.

B. Protect public and private property against damage.

C. Protect all work including building finishes against damage due to dirt, water, chemicals, frost, heat, handling, theft, and etc. Keep openings in conduit and equipment closed with suitable plugs or caps during installation.

D. Provide necessary warning devices, barricades, or coverings required for safety around exposed "live" parts or high temperature surfaces.

3.09 CHASES AND OPENINGS:

A. Provide templates or details for chases and other openings required through floors, walls, ceilings, and etc. to accommodate conduit.

B. Provide any necessary cutting or drilling for required openings, and patch and refinish as directed.

3.10 PAINTING:

A. Painting shall be performed in accordance with the painting section of these specifications.

B. Paint conduit, equipment, and etc. exposed in finished areas to match adjacent surfaces as directed.

C. Paint conduit flat black, or as directed, if visible through grilles or other openings.

D. Paint all exposed conduit and equipment on outside of building or in equipment rooms for uniform appearance or identification as directed.

E. Paint plywood backboards used for mounting equipment prior to installing equipment.

F. Touch-up scratches in factory finished surfaces with an approved paint to match the surface.

3.11 TESTING AND ADJUSTING:

A. Test the completed electrical systems and prove free from short circuits, poor connections, and improper grounding.

B. Maintain on the premises a first class voltmeter, ammeter, milli-ohmmeter, and meggar insulation tester in proper calibration and provide test measurements as required.

1. Meggar all 600 volt rated wiring at 1000 volts minimum before applying power. Prove resistance in excess of 10 megohms.
2. Test metal conduit and grounds for continuity and prove resistance less than one ohm to farthest outlet from system ground.
3. Test system ground to earth per the NEC.

C. Align, adjust, calibrate, and test all systems to assure safe and proper operation.

D. Verify proper taps on motors and transformers for rated performance.

3.12 POST CONSTRUCTION SUBMITTALS:

A. Deliver special tools, and other products necessary for proper operation and maintenance of the electrical systems.

B. Deliver spare parts as called for under other Electrical Sections contained herein or on the Drawings.

C. Submit Project Record Documents indicating all changes from the Contract Documents made during construction.

D. Submit Certificates of Final Inspections from the Administrative Authority.

E. Submit Operation and Maintenance Manuals covering all phases of equipment and systems provided. Include complete spare parts data with current prices and sources of supply. Include copy of manufacturing data sheets and shop drawings required in pre-construction submittals.

F. Submit extended warranties in excess of the standard one year warranty where required by other Electrical Sections contained herein or on the Drawings.

G. Assemble all post construction documents for electrical system in 3-ring binder(s) with divider tabs labeled and properly indexed. Submit the number of sets and arranged as required by Architect.

H. Submit all closeout documents in accordance with Division 1 of these specifications.

3.13 INSTRUCTIONS TO OWNER:

A. Provide competent instruction to Owner's personnel covering operation and maintenance of all electrical systems. Provide specialized instruction by manufacturer's technical representatives when required.

3.14 USE OF EQUIPMENT:

A. The contractor shall not use the permanent electrical system for construction activity except by special permission.

B. If permitted, the contractor’s use of any equipment shall not reduce warranty time specified for the equipment.

C. If permitted, lamps, ballasts and other such items used during construction shall be replaced by the contractor prior to acceptance if used for more than 5% of their rated life.

3.15 GENERAL WARRANTY:

A. Warrant the electrical installation against defects in products and/or workmanship for a period of one (1) year from the date of substantial completion in accordance with architect's specifications.

B. Provide all labor, replacement parts, services, transportation, and incidental costs necessary for the proper operation of all electrical systems during the warranty period.

C. Make good any damage to the building or grounds or other equipment resulting from defects in products and/or workmanship during the warranty period.

END OF SECTION

WIRES AND CABLES
SECTION 16120

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. Power wiring and connectors, 600 volts or less

B. Control and signal wiring and connectors

C. Miscellaneous materials

1.02 RELATED WORK:

A. Section 16010 General Electrical Requirements

1.03 SUBMITTALS:

A. Submit Manufacturers data sheets for fixture whips and for each type of wiring connector proposed for use.

PART 2 - PRODUCTS

2.01 POWER WIRING AND CONNECTORS:

A. For service entrance, feeders and branch circuits, use single conductor annealed copper with 600-volt code type THHN insulation for above ground dry locations and dual rated THHN/THWN insulation for wet locations or underground or under slab locations unless noted otherwise.

D. #12 and #10 AWG wire used for lighting, receptacles, and other non-vibrating equipment may be solid conductor. All other wiring including wiring connecting to motors, transformers, and special grounding systems shall be stranded conductor.

E. Make splices required in #12 and #10 AWG wire with insulated "Scotchlok" connectors.

F. Make splices in all wire #8 AWG or larger with approved crimp-on or bolted pressure connectors with snap-on or bolt-on insulated caps. Approved device is NSI type Polaris connectors.

G. The voltage and temperature ratings of the connector insulator shall be at least equal to that required of the conductor insulation.

H. Furnish wire with color coding conforming to the following:

Conductor	250V or Less	480V/277V
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

Color coding may be solid or striped-colored insulation. Colored plastic tape may be used at terminations on #8 AWG and larger conductors with black insulation.

2.02 CONTROL AND SIGNAL WIRING AND CONNECTORS:

A. Use stranded annealed copper conductors with insulation suitable for the purpose.

B. For applications, 50 volts and greater, use #14 AWG minimum size conductor with 600 volt insulation and approved for the application.

C. For power limited wiring and less than 50 volts, use #18 AWG minimum size conductor except for multi-conductor cable recommended or required by the system manufacturer.

D. For power limited wiring in air plenums, use type CLP, CMP or FPLR if not in conduit for signal, communication, or fire alarm, respectively.

E. For power limited wiring not in air plenums or installed in conduit and used for fire alarm and detection systems, use type FPL.

F. Make splices required in #14 through #10 AWG wire with insulated "Scotchlok" connectors.

G. Make splices required in #16 AWG and smaller wire with insulated crimp-on terminals screw connected to numbered terminal strips, or use approved cable connectors.

H. Provide RG-6 coax cable with type "F" connectors for TV cable where shown.

2.03 MISCELLANEOUS MATERIALS:

A. Where required, use wire lubricating compound suitable for the wire insulation and conduit and that does not harden nor become adhesive. Do not use on wiring for isolated power systems.

B. Use plastic tape that is flame retardant and cold and weather resistant equal to Scotch #33.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Thoroughly clean conduit prior to pulling-in wires. Do not install wire until the raceway can be maintained in a dry condition.

B. Use non-metallic pulling ropes attached to the conductors by means of woven basket grips or pulling eyes. Pull all conductors for a conduit run in together in such a manner as to avoid damage to the conductors, insulation, or conduit.

C. Neatly trim and nest multiple conductors and cables in boxes and enclosures and hold in place with "tie-wraps." Where conductors terminate in panelboards, arrange conductors to be perpendicular or parallel to circuit breaker line-up.

D. Make splices and terminations mechanically and electrically secure. Splices shall only be made in a suitable accessible junction box.

E. Where multiple paralleled conductor make-ups are indicated on the Drawings for large feeders, the conductors shall be identical in length, gauge, code type, and etc., and shall be terminated exactly alike.

END OF SECTION

BOILER SEQUENCE OF OPERATION

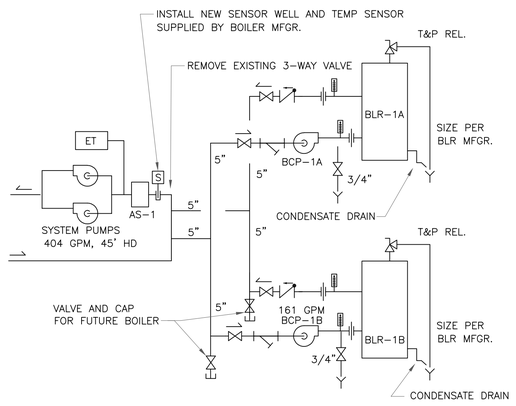
THE HEATING WATER PUMP SHALL BE STARTED AND THE LEAD BOILER SHALL BE ENABLED WHEN THE OURDOOR AIR TEMPERATURE DROPS BELOW 65 DEGREES. WHEN ENABLED THE BOILERS SHALL OPERATE BY THEIR OWN CONTROLS. SEE SPECIFICATIONS BOOK.

BOILER SCHEDULE

MARK	DESCRIPTION	MFGR	MODEL	MBH IN	MBH OUT	CONTROL	REMARKS
HWB-1,2	HEATING WATER BOILER, GAS FIRED, CONDENSING TYPE	LOCHINVAR	CREST FB 3500	3500	3220	INTERFACE WITH JCI SYSTEM.	120V POWER FOR CONTROLS AND PUMP. MANUFACTURER'S CIRCULATING PUMP. STAINLESS STEEL HEAT EXCHANGER. PROVIDE NEW GAS REGULATOR FOR EACH BOILER PROVIDED BY BOILER MANUFACTURER AND EQUAL TO SAP 100269924 WITH 2" GAS PIPE CONNECTIONS. BOILER CIRCULATING PUMPS BCP-1A AND BCP-1B SHALL BE VARIABLE SPEED LOCHINVAR PUM20080 161 GPM, 2.2 FT HD. 18:1 TURNDOWN RATIO. COMBUSTION AIR FILTER BOX TO BE INSTALLED IN COMBUSTION AIR DUCT.
AS-1	AIR AND DIRT SEPARATOR	SPIRO-THERM	VHN 500FA				PROVIDE LINE SIZE SEPARATOR AND ALL PIPING AND ACCESSORIES.

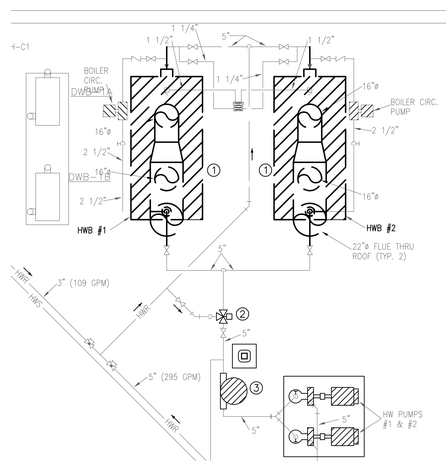
PIPING AND INSULATION SCHEDULE

SERVICE	PIPING TYPE	INSULATION TYPE	INSULATION THICKNESS
HOT WATER HEATING TO 250°F	STEEL, SCHEDULE 40, BLACK TYPE "L" HARD COPPER	FIBERGLASS	1" UP TO 2" PIPE SIZE 1 1/2" ABOVE 2" PIPE SIZE
ABOVE GROUND GAS	SCHEDULE 40 BLACK STEEL WITH MALLEABLE IRON FITTINGS OR WELDED JOINTS WITH BUTT WELD FITTINGS.		



C NEW BOILERS PIPING SCHEMATIC

NTS

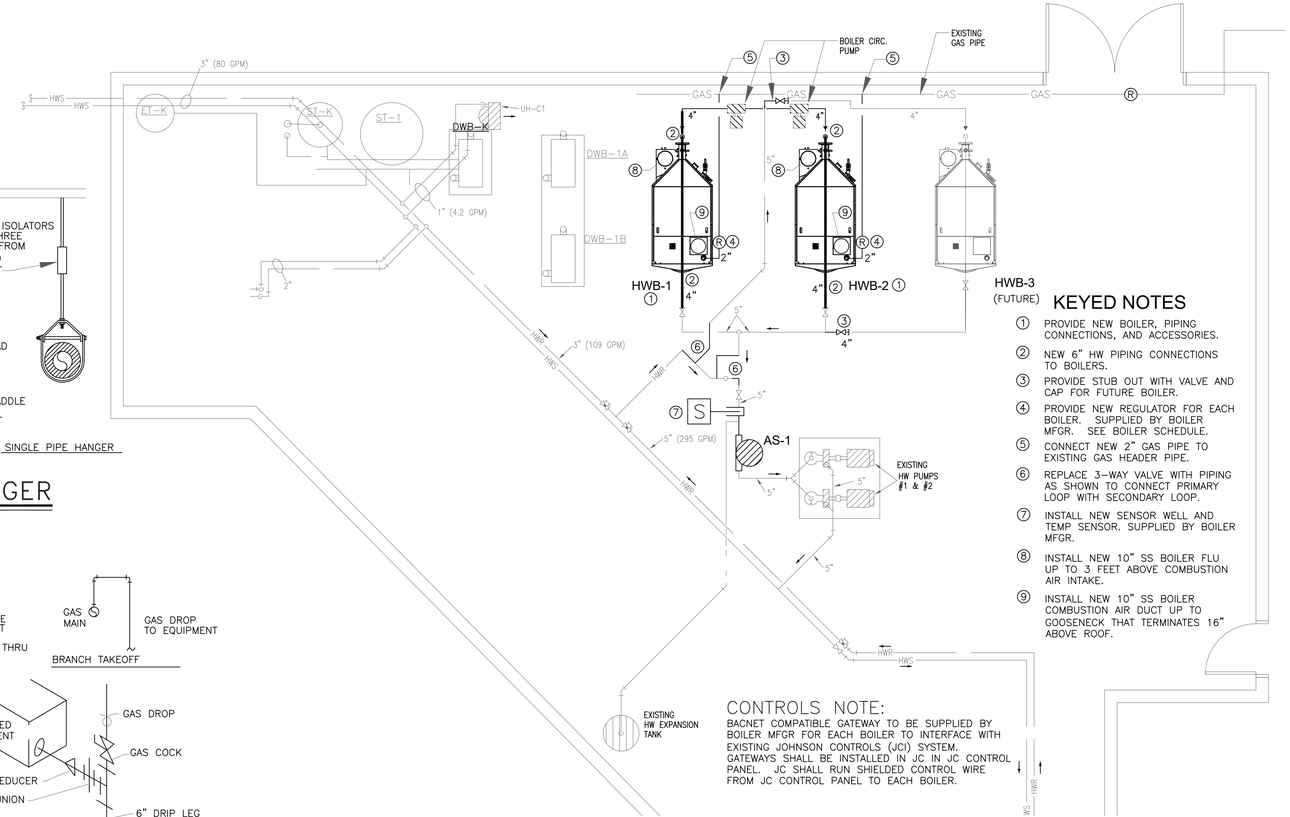


B MECHANICAL ROOM DEMO PLAN

Scale: 1/4" = 1'-0"

DEMO KEYED NOTES

1. REMOVE EXISTING BOILERS HWB-1 AND HWB-2 AND DISPOSE OF. DEMO AND DISPOSE OF FLUE THRU ROOF. PRESERVE ROOF OPENING FOR NEW FLUES.
2. REMOVE EXISTING 3-WAY VALVE AND DISPOSE OF. REPLACE WITH TEE TO CONNECT SUPPLY AND RETURN CROSSOVER CONNECTION.
3. REMOVE EXISTING AIR SEPARATOR AND DISPOSE OF. REPLACE WITH NEW ONE.



KEYED NOTES

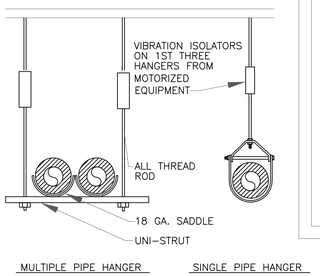
1. PROVIDE NEW BOILER, PIPING CONNECTIONS, AND ACCESSORIES.
2. NEW 6" HW PIPING CONNECTIONS TO BOILERS.
3. PROVIDE STUB OUT WITH VALVE AND CAP FOR FUTURE BOILER.
4. PROVIDE NEW REGULATOR FOR EACH BOILER. SUPPLIED BY BOILER MFGR. SEE BOILER SCHEDULE.
5. CONNECT NEW 2" GAS PIPE TO EXISTING GAS HEADER PIPE.
6. REPLACE 3-WAY VALVE WITH PIPING AS SHOWN TO CONNECT PRIMARY LOOP WITH SECONDARY LOOP.
7. INSTALL NEW SENSOR WELL AND TEMP SENSOR. SUPPLIED BY BOILER MFGR.
8. INSTALL NEW 10" SS BOILER FLU UP TO 3 FEET ABOVE COMBUSTION AIR INTAKE.
9. INSTALL NEW 10" SS BOILER COMBUSTION AIR DUCT UP TO GOOSENECK THAT TERMINATES 16" ABOVE ROOF.

CONTROLS NOTE:

BACNET COMPATIBLE GATEWAY TO BE SUPPLIED BY BOILER MFGR FOR EACH BOILER TO INTERFACE WITH EXISTING JOHNSON CONTROLS (JCI) SYSTEM. GATEWAYS SHALL BE INSTALLED IN JC IN JC CONTROL PANEL. JC SHALL RUN SHIELDED CONTROL WIRE FROM JC CONTROL PANEL TO EACH BOILER.

A MECHANICAL ROOM PLAN

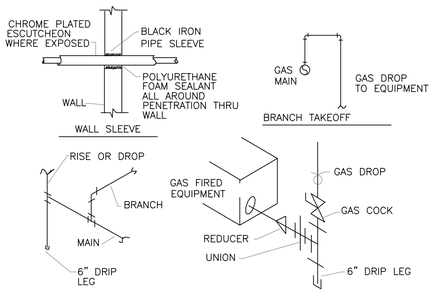
Scale: 1/4" = 1'-0"



MULTIPLE PIPE HANGER SINGLE PIPE HANGER

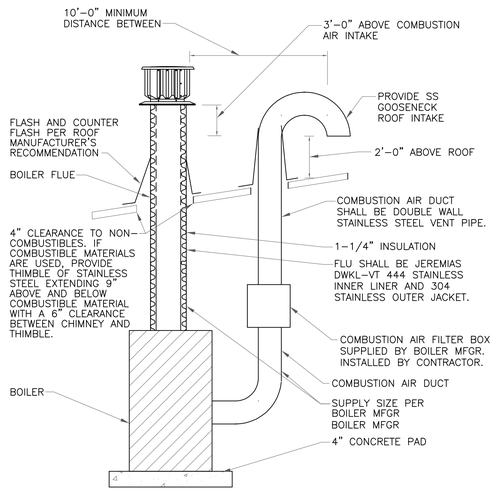
E PIPE HANGER

N.T.S.



F GAS PIPING DETAIL

Scale: N.T.S.



D BOILER FLUE

SCALE: N.T.S.

GENERAL NOTES

1. CONTRACTOR SHALL COORDINATE WORK WITH THE OWNER SO THAT THE DOMESTIC HOT WATER SYSTEM IS NOT SHUT DOWN FOR MORE THAN 6 HOURS AT A TIME.
2. ALL DIMENSIONS AND SIZES IN INCHES UNLESS OTHERWISE NOTED.
3. THE DRAWINGS INDICATE THE GENERAL LAYOUT REQUIREMENTS FOR EQUIPMENT, FIXTURES, PIPING, DUCTWORK, ETC. FINAL LAYOUT SHALL BE GOVERNED BY ACTUAL FIELD CONDITIONS WITH ALL MEASUREMENTS VERIFIED AT THE SITE.
4. CONTRACTOR IS RESPONSIBLE FOR VERIFYING THAT ALL SYSTEMS AND COMPONENTS WILL FIT BEFORE FABRICATION OR ORDERING. INSTALLED DUCTS MAY BE RESIZED BY THE CONTRACTOR TO FIT FIELD CONDITIONS. THE INSTALLED DUCTS SHALL HAVE EQUAL FRICTION LOSS TO THOSE SHOWN. RECTANGULAR DUCTS SHALL NOT BE CHANGED TO ROUND DUCTS. PROVIDE COMPLETE SHEET METAL SHOP DRAWINGS TO ENGINEER SHOWING ALL ACTUAL DUCT SIZES, ARRANGEMENTS AND UNIT LOCATIONS TO BE INSTALLED. THIS SHALL BE DONE PRIOR TO FABRICATION OR INSTALLATION.
5. –
6. THE CONTRACTOR SHALL PROVIDE A COMPLETE AND OPERATING MECHANICAL SYSTEM, INCLUDING ALL INCIDENTAL ITEMS AND CONNECTIONS NECESSARY FOR PROPER OPERATION OR CUSTOMARILY INCLUDED, EVEN THOUGH EACH AND EVERY ITEM MAY NOT BE INDICATED.
7. THE MECHANICAL INSTALLATION SHALL BE SAFE, RELIABLE, ENERGY EFFICIENT AND EASILY MAINTAINED WITH ADEQUATE PROVISIONS ALLOWED FOR ACCESS TO EQUIPMENT.
8. THE MECHANICAL SYSTEM SHALL OPERATE QUIETLY WITH NOISE LEVELS BELOW THE CRITERIA RECOMMENDED FOR THE APPLICATION BY ASHRAE. PROVIDE CORRECTIVE ACTION AS REQUIRED TO REDUCE OBJECTIONABLE NOISE OR VIBRATION.
9. PROVIDE ALL POWER WIRING AND CONTROLS AS REQUIRED AND RECOMMENDED BY MANUFACTURERS FOR PUMPS, CONTROLS, AND SENSORS. USE EXISTING BOILER POWER CIRCUIT.
10. –

STATE OF ARKANSAS REGISTERED PROFESSIONAL ENGINEER No. 7098 GREGORY G. ANDERSON 6-1-18

CERTIFICATE OF AUTH. GA ENGINEERS, INC. #87 ARKANSAS ENGINEER

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HEATING WATER BOILERS REPLACEMENT

BENTON COUNTY JAIL

BENTONVILLE, ARKANSAS

GA PROJECT NUMBER: 17021

PERCENT COMPLETE: ISSUE

DATE: 6-1-18

CONTENTS: MECHANICAL PLANS

SHEET NO. M1