AH&P
CONSULTING ENGINEERS
250 Charter Lane
Suite 100
Macon, GA 31210

HEATING UPGRADE

FOR ATKINSON HALL

GEORGIA COLLEGE & STATE UNIVERSITY

MILLEDGEVILLE, GEORGIA

Andrews, Hammock & Powell, Inc.
Telephone: (478) 405-8301
Fax: (478) 405-8210

June 25, 2013

DESIGN-BID-BUILD
CONSTRUCTION CONTRACT

BETWEEN CONTRACTOR AND OWNER

TO BE USED WITH
BOARD OF REGENTS OF THE UNIVERSITY SYSTEM OF GEORGIA'S
DESIGN PROFESSIONAL (ARCHITECTURAL) CONTRACT

BETWEEN

LEGAL GC FIRM NAME
(CONTRACTOR)

AND

BOARD OF REGENTS OF THE UNIVERSITY SYSTEM OF GEORGIA
(OWNER)

For the Use and Benefit of:

GEORGIA COLLEGE & STATE UNIVERSITY
USING AGENCY (INSTITUTION)

PROJECT NO. **HEATING UPGRADE AT ATKINSON HALL**

INCLUDES:

EXECUTIVE SUMMARY OF CONTENTS

CONSTRUCTION CONTRACT

BETWEEN CONTRACTOR AND OWNER

THIS CONSTRUCTION CONTRACT (hereinafter the "Contract") made this **Date** day of **Month, Year** (hereinafter the "Effective Date"), by and between the **BOARD OF REGENTS OF THE UNIVERSITY SYSTEM OF GEORGIA** (hereinafter the "Owner"), for the use and benefit of **INSTITUTION NAME** (hereinafter the "Using Agency" or "Institution") **LEGAL GC Firm Name**, (hereinafter the "General Contractor" / "Contractor"), whose address is MUST be a physical address. NO P.O. Boxes.; Phone: XXX-XXX-XXXX; Fax XXX-XXX-XXXX

(a) Contractor's FEIN or Tax Identification Number: _____

(b) Contractor's Georgia License Type and Number: _____

(c) Contractor's Federal Employment Verification Certification:
The Contractor is registered with, authorized to use, is using and will continue to use, the federal work authorization program throughout the term of the contract, and holds the following authorization:

User Identification Number: _____

Date of Authorization: **Date**

WITNESSETH, that the Contractor and the Owner, for the consideration set forth herein, the adequacy and sufficiency of which is hereby acknowledged by each party, agree as follows:

Project No. Project Number

Project Name and Description: **PROJECT NAME AND DESCRIPTION** (hereinafter the "Project.")

1. Existing Documents. The Contractor has reviewed and taken into consideration the Bidding Documents in preparing his bid.

2. The Contract Sum: The Owner shall pay the Contractor for the performance of the contract, subject to additions and deductions provided by approved change orders, in current funds, the Contract Sum as follows, base bid less Deductive Alternate 1:

AND /100 DOLLARS ($)

3. The Material Completion and Occupancy Date shall be achieved within **Days** consecutive calendar days beginning the date specified in the Proceed Order. ***(Or by a date certain – be specific as to what was represented in the Bid Documents – REMOVE THIS STATEMENT PRIOR TO FINALIZING THE CONTRACT!)***

4. **The agreed daily amount for Liquidated Damages is:** **$**_____ per day.

5. **The agreed daily amount for Time Dependent Overhead Costs is:** $_____ per day.

6. Notice. All notices in accordance with Section 1.1.5 shall be given to the following addresses:

CONTRACTOR:	LEGAL GC Firm Name Physical Address, NO P.O. Boxes City, State Zip Attention: CM-POC, Title Phone Number: CM-POC Phone Facsimile Number: CM-POC Fax Email: CM-POC Email address
OWNER:	Board of Regents of the University System of Georgia 270 Washington Street, SW, 6th Floor Atlanta, Georgia 30334 Attention: Jim James, Vice Chancellor for Facilities Phone Number: 404-962-3155 Facsimile Number: 404-962-3188
OWNER'S REPRESENTATIVE:	Board of Regents of the University System of Georgia 270 Washington Street, SW, 6th Floor Atlanta, Georgia 30334 Attention: Choose One Phone Number: BOR-PM Phone Facsimile Number: 404-962-3188 Email: Choose Appropriate Email
USING AGENCY (Institution):	Institution Name Physical Address, NO P.O. Boxes City, State Zip Attention: Project POC, Title Phone Number: Project POC Phone Facsimile Number: Project POC Fax Email: Project POC Email Address
DESIGN PROFESSIONAL:	LEGAL DP Firm Name Physical Address, NO P.O. Boxes City, State Zip Attention: DP-POC, Title Phone Number: DP-POC Phone Facsimile Number: DP-POC Fax Email: DP-POC Email Address

7. Scope Of The Work: The Contractor shall furnish all the materials, perform all of the Work, and do all things required by the Contract Documents.

8. Schedule and Completion: The Pre-commencement Phase Services to be performed under this Contract shall commence upon the Effective Date of the Contract and be completed within 60 days thereafter. Activities on the Site shall commence on the date specified in the Proceed Order and shall be materially complete in accordance with established Milestones, and not later than the Material Completion and Occupancy Date.

9. Periodic Progress Payments: The Owner shall make progress payments, less retainage, as set forth in Section 4 of the General Conditions.

10. Payment for Material Completion: The Contractor may request payment of the remaining contract balance, including retainage, less amounts credited the Owner or incurred as liquidated damages, and less amounts withheld for

the Punchlist by reason of Minor Items or Permitted Incomplete Work (See Paragraph 6.5.3.2). Payment for Material Completion shall be made by a check payable jointly to the Contractor and Surety and shall be mailed to the Surety.

11. Final Payment: Final Payment shall be made within ten days of receipt of the final payment application as set forth in Section 6, Part 2 of the General Conditions, provided that all other requirements of the Contract shall have been met in full.

12. **The Contract Documents**: **This Contract, together with the Bidding Documents and the Bid, shall constitute the Contract Documents for the Project.**

13. Bonds: The Contractor shall furnish both a performance bond and a payment bond and shall pay the premiums thereon as a Cost of the Work. The Performance Bond shall guarantee the full performance of the Contract.

14. Full Performance: The Owner and the Contractor hereby agree to the full performance of the Contract Documents.

15. Applicable Law: This Contract and all rights, privileges and responsibilities shall be interpreted and construed according to the laws of the State of Georgia.

16. No Conflict Of Interest: The Contractor covenants that it presently has no interest and shall not acquire any interest, direct or indirect, that would conflict in any manner or degree with the performance required under this Contract. The Contractor further covenants that, in the performance of this Contract, it shall neither contract with nor employ any person having any such interest.

17. Transactions With State Officials, Ethics: The parties hereto certify that the provisions of law contained in the Act prohibiting full-time appointive officials and employees of the State from engaging in certain transactions affecting the State as defined in O.C.G.A. §§45-10-20–26 and the Governor's Executive Orders governing ethics, have not and will not be violated in any respect in regard to this contract and further certifies that registration and all disclosures required thereby have been complied with.

18. No Assignment: This Contract and the proceeds of this Contract may not be assigned or sublet as a whole, nor may the performance thereunder be assigned, without the prior written consent of the Owner.

19. No Waiver: The failure of the Owner at any time to require performance by the Contractor of any provision hereof, shall in no way affect the right of the Owner thereafter to enforce any provision or any part of the Contract, nor shall the failure of the Owner to enforce any breach of any provision hereof to be taken or held to be a waiver of such provision, or as a waiver, modification or rescission of the Contract itself.

20. Full Agreement. The Contract Documents supersede all prior negotiations, discussion, statements, and agreements between Owner and Contractor and constitute the full, complete, and entire agreement between Owner and Contractor. There can be no changes to this Contract by oral means, nor by course of conduct of the parties, nor by custom of the trade. No changes to this Contract will be binding on either party hereto unless such change is properly authorized, in writing, in accordance with Section 3, Part 2 of the General Conditions.

[Remainder of Page Intentionally Left Blank]

[Signatures Begin on Next Page]

IN WITNESS WHEREOF the parties hereto have executed this Contract the day and year first written above.

LEGAL GC FIRM NAME
Contractor

ATTEST:

_____ (L.S.)

_____, SECRETARY

(SEAL, OVER SIGNATURE)
(If not a corporation, signature must be notarized.)

BY: _____ (L.S.)

_____, PRESIDENT

APPROVED: USING AGENCY

BY: _____
PRINT NAME AND TITLE
INSTITUTION NAME

WITNESS: _____

_____
(PRINT NAME / TITLE)

BOARD OF REGENTS OF THE UNIVERSITY SYSTEM OF GEORGIA, OWNER

BY: _____ (L.S.)
JIM JAMES
VICE CHANCELLOR FOR FACILITIES

WITNESS: _____
SHEREE WILDER SRADER
DIRECTOR OF CONTRACTS & SERVICES

Attachments:
1. General Conditions and Forms
2. Supplementary General Conditions

BID REQUIREMENTS

INVITATION TO BID

The Owner will receive sealed bids from Contractors in **Georgia College Facilities Management, 2nd Floor Conference Room, Miller Court, 302 North Wayne Street, Georgia College & State University, Milledgeville, Georgia 31061** (Address). Bids must be physically on the table in the Bid Room by **Two o'clock p.m.**, at the time legally prevailing in Milledgeville, Georgia on **July 30, 2013**, for the construction of **Heating Upgrade for Atkinson Hall,** located in **Milledgeville, Georgia.** At the time and place noted above, the bids will be publicly opened and announced.

Bidders are cautioned that acquisition of Bidding Documents through any source other than the office of the Design Professional or Georgia College and State University is not advisable. Acquisition of Bidding Documents from unauthorized sources places the bidder at risk of receiving incomplete or inaccurate information upon which to base a bid.

There will be a *pre-bid* conference held on **Tuesday, July 16th at 2:00 p.m.** at **Georgia College Facilities Management, 2nd Floor Conference Room, Miller Court, 302 North Wayne Street, Georgia College & State University, Milledgeville, Georgia 31061.** Attendance at this conference is **MANDATORY** for any Contractor intending to bid on this project. Others may attend if they so desire.

Bid documents are available at no charge and may be downloaded from the internet by visiting the State Purchasing website at Georgia Procurement Registry . Upon reaching the Georgia Procurement Registry Search Engine, under "Government Type" select State Government, under Government Entity select Georgia College and State University and then search for this solicitation. **Bidder should check the web site daily for updates, addenda and any other additional information.**

Contract, if awarded, will be on a lump sum basis. No bid may be withdrawn for a period of thirty-five days after time has been called on the date of opening except in accordance with the provisions of Georgia law. Bids must be accompanied by a Bid Bond made payable to the Owner in an amount equal to not less than five percent of the Bid. Both a performance bond and a payment bond will be required, each in an amount equal to 100 percent of the Contract Sum prior to execution of contract.

The Owner reserves the right in its sole and complete discretion to waive technicalities and informalities. The Owner further reserves the rights in its sole and complete discretion to reject all bids and any bid that is not responsive or that is over the budget. The Owner anticipates that the contract will be awarded to the responsive and responsible bidder who provides the lowest bid within the budget. In judging whether the bidder is responsible, the Owner will consider, but is not limited to, the following:

- Whether the bidder or its principals are currently ineligible, debarred, suspended, or otherwise excluded from bidding or contracting by any state or federal agency, department, or authority;
- Whether the bidder or its principals have been terminated for cause or are currently in default on a public works contract;
- Whether the bidder can demonstrate sufficient cash flow to undertake the project as evidenced by a Current Ratio of 1.0 or higher;
- Whether the bidder can demonstrate a commitment to safety with regard to Workers' Compensation by having an Experience Modification Rate (EMR) over the past three years not having exceeded an average of 1.2; and
- Whether the bidder's past work provides evidence of an ability to successfully complete public works projects within the established time, quality, or cost, or to comply with the bidder's contract obligations.

In the event all responsive and responsible bids are in excess of the budget, the Owner, in its sole and absolute discretion and in addition to rejecting all bids, reserves the right either to supplement the budget or to negotiate with the lowest responsive and responsible bidder (after all deductive alternates are taken) but only for the purpose of making changes to the project that will result in a cost to the Owner that is within the budget, as it may be supplemented.

BOARD OF REGENTS OF THE UNIVERSITY SYSTEM OF GEORGIA
GEORGIA COLLEGE AND STATE UNIVERSITY

BY: MARK MEEKS, DIRECTOR OF MATERIALS MANAGEMENT AND CENTRAL SERVICES

BID REQUIREMENTS

INSTRUCTIONS TO BIDDERS

1. **Basis of Contract.** Contract, if awarded, will be on a lump sum basis and will be substantially in accordance with the Contract shown on pages Contract – 1 to Contract – 4.

2. **Examination of Site.** In undertaking the work under this Contract, the Contractor acknowledges that he has visited the Project Site and has taken into consideration all observed conditions that might affect his work.

3. **Surety and Insurance Companies.** The Contract provides that the surety and insurance companies must be acceptable to the Owner. Only those sureties listed in the Department of Treasury's Listing of Approved Sureties (Department Circular 570) are acceptable to the Owner. At the time of issuance, all insurance and bonds must be issued by a company licensed by the Georgia Insurance Commissioner to transact the business of insurance in the State of Georgia for the applicable line of insurance. Such company shall be an insurer (or, for qualified self insurers or group self insureds, a specific excess insurer providing statutory limits) with an A.M. Best Financial Strength Rating of "A-" or better and with an A.M. Best Financial Size Category of Class V or larger.

4. **Bidding Documents.** The Bidding Documents comprise the Construction Documents, the Invitation to Bid, the Instructions to Bidders, the Bid Form, and all Addenda, upon which the bidder submits a bid.

5. **Addenda.** All Addenda issued prior to bid date adjust, modify, or change the drawings and specifications as set forth in the Addenda. No Addenda will be issued within five days of the date set for opening bids without an extension of the bid date. All such Addenda are part of the contract.

6. **Interpretations.** No oral interpretation will be made to bidders as to the meaning of the drawings and specifications. Requests for interpretation of drawings and specifications must be made in writing to the Design Professional not later than six days prior to the date set for receipt of the bids. Failure on the part of the successful bidder to request clarification shall not relieve him as Contractor of the obligation to execute such work in accordance with a later interpretation by the Design Professional. All interpretations made to bidders will be issued in the form of Addenda to the plans and specifications and will be sent to all plan holders of record. Acknowledgement of receipt of such Addenda shall be listed in the Bid Form by the Contractor.

7. **Alternates.** Unless otherwise stipulated, all alternate bids are deductive. It is in the best interest of the public, and the intent of the Owner is, that the entire Project be constructed within the funds allocated in the Project budget. The acceptance of any deductive alternate will be utilized as a last resort to accomplish the Project without requiring a redesign and rebidding of the Project. Any alternate, or alternates, if taken, will be taken in numerical sequence to the extent necessary.

8. **Sales Tax.** Unless otherwise provided for in the Contract Documents, the Contractor shall include in his bid all sales taxes, consumer taxes, use taxes, and all other applicable taxes that are legally in effect at the time bids are received.

9. **Trade Names, Specifications.**

(a) *No Restriction of Competition.* When reference is made in the Contract Documents to trade names, brand names, or to the names of manufacturers, such references are made solely to indicate that products of that description may be furnished and are not intended to restrict competitive bidding. If it is desired to use products of trade or brand names or of manufacturers' names that are different from those mentioned in the Bidding Documents, application for the approval of the use of such products must reach the hands of the Design Professional at least ten days prior to the date set for the opening of bids (*see* 9(b) below). This provision applies only to the party making a submittal prior to bid. If approved by Design Professional, the Design Professional will issue an addendum to all bidders. This provision does not prevent the Owner from initiating the addition of trade names, brand names, or names of manufacturers by addendum prior to bid.

(b) *Request for Approval of Substitute Product*. All requests for approval of substitution of a product that is not listed in the Bidding Documents must be made to the Design Professional in writing. For the Design Professional to prepare an addendum properly, an application for approval of a substitute product must be accompanied by a copy of the published recommendations of the manufacturer for the installation of the product together with a complete schedule of changes in the drawings and specifications, if any, that must be made in other work in order to permit the use and installation of the proposed product in accordance with the recommendations of the manufacturer of the

product. The application to the Design Professional for approval of a proposed substitute product must be accompanied by a schedule setting forth in which respects the materials or equipment submitted for consideration differ from the materials or equipment designated in the Bidding Documents.

(c) *Burden of Proof.* The burden of proving acceptability of a proposed product rests on the party making the submission. Therefore, the application for approval must be accompanied by technical data that the party requesting approval desires to submit in support of its application. The Design Professional will consider reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed product with previous users, evidence of reputation of the manufacturer for prompt delivery, evidence of reputation of the manufacturer for efficiency in servicing its products, or any other written information that is helpful in the circumstances. The degree of proof required for approval of a proposed product as acceptable for use in place of a named product or named products is that amount of proof necessary to convince a reasonable person beyond all doubt. To be approved, a proposed product must also meet or exceed all express requirements of the Contract Documents.

(d) *Issuance of Addenda.* If the Design Professional approves the submittal, an addendum will be issued to all prospective bidders indicating the approval of the additional product(s). Issuance of an addendum is a representation to all bidders that the Design Professional in the exercise of his professional discretion established that the product submitted for approval is acceptable and meets or exceeds all express requirements. If a submittal is initially rejected by the Design Professional, but determined to be acceptable to Design Professional after a conference with the Owner, an addendum covering the said submittal will be issued prior to the opening of bids. The successful bidder may furnish no products of any trade names, brand names, or manufacturers' names except those designated in the Contract Documents unless approvals have been published by addendum in accordance with the above procedure. Oral approvals of products are not valid.

(e) *Conference with the Owner*. Any party who alleges that rejection of a submittal is the result of bias, prejudice, caprice, or error on the part of the Design Professional may request a conference with a representative of the Owner, provided: that the request for said conference, submitted in writing, shall have reached the Owner at least six days prior to the date set for the opening of bids, time being of the essence.

10. **Employment of Georgia Citizens and Use of Georgia Products.** The work provided for in this Contract is to be performed in Georgia. It is the desire of the Owner that materials and equipment manufactured or produced in Georgia shall be used in the work and that Georgia citizens shall be employed in the work at wages consistent with those being paid in the general area in which the work is to be performed. This desire on the part of the Owner is not intended to restrict or limit competitive bidding or to increase the cost of the work; nor shall the fulfillment of this desire be asserted by the Contractor as an excuse for any noncompliance or omission to fulfill any obligation under the contract.

11. **Trading with the State Statutes, Ethics.** By submitting a bid, the bidder certifies that the provisions of law contained in O.C.G.A. Sections 45-10-20 to 45-10-71, which prohibit officials and employees of the state from engaging in certain transactions with the state and state agencies, and the Governor's Executive Orders governing ethics, have not and will not be violated in any respect in regard to this contract and further certifies that registration and all disclosures required thereby have been complied with.

12. **Georgia Security and Immigration Compliance Act Requirements.** No bid will be considered unless the Contractor certifies its compliance with the Immigration reform and Control Act of 1986 (IRCA), D.L. 99-603 and the Georgia Security Immigration Compliance Act OCGA 13-10-91 *et seq.* The Contractor shall execute the Georgia Security and Immigration Compliance Act Affidavit, as found in Section 7 of the Construction Contract. Contractor also agrees that it will execute any affidavits required by the rules and regulations issued by the Georgia Department of Audits and Accounts. If the Contractor is the successful bidder, contractor warrants that it will include a similar provision in all written agreements with any subcontractors engaged to perform services under the Contract.

13. **Owner's Policy Statement.** The policy of the Owner is that minority business enterprises shall have the maximum opportunity to participate in the Owner's purchasing process. The Owner encourages all minority business enterprises to compete for, win, and receive contracts for goods, services, and construction. In addition, Georgia law provides a state income tax credit available to any business that subcontracts with a minority-owned business. [*See* O.C.G.A. §48-7-38 and O.C.G.A. §50-5-130. *See also* Executive Order of the Governor No. A-11-0002-1992.] For more information, please contact the Board of Regents' Office of Business Development by e-mail at BusinessDevelopment@usg.edu. Any questions regarding statements contained hereunder should be directed to {Name, Address, and Telephone Number of Designee, as described in the box below}.

14. **Bids.**

(a) *Bid Opening.* Bids will be opened and announced as stated in the Invitation to Bid.

(b) *Bid Submission.* All bids must be submitted on the Bid Form as attached hereto and must be signed, notarized, and sealed by a notary public. All blanks for information entry in bid forms submitted to Owner should be filled. Blanks left unfilled constitute irregularities in the bid and place the bidder at risk of having the bid rejected *unless* the Owner rules the irregularity to be an informality or technicality that the director can waive, as is made clear in Paragraph 16 of these "Instructions to Bidders" and on the Bid Form. Numbers shall be written in English words and in Arabic numerals. **The inclusion of any condition, alternate, qualification, limitation, or provision not called for shall render the bid nonresponsive and shall be sufficient cause for rejection of a bid.**

(c) *Bid Security.* Bids must be accompanied by a Bid Bond made payable to the Owner in an amount not less than five percent of the Bid. Bid Bonds should be furnished on forms accepted as standard by the insurance industry, but shall be substantially in accordance with the Bid Security Form attached hereto.

(d) *Delivery of Bids.* Bids are to be addressed to the Owner, at the address and room number shown in the Invitation to Bid. Bids must be enclosed in an opaque, sealed envelope; marked with the Bid Date, Bid Time, Bid Number, Name of Project; and identified with the words "Bid for Construction." Bids must be placed in the hands of the Owner at the specified location by not later than the hour and date named in the Invitation to Bid. After that time, no bids may be received. It is the sole responsibility of the bidder to ensure the delivery of the bids to the required address.

(e) Alternates*.* A bid must be submitted for all alternates. Failure to so may render the bid nonresponsive and be sufficient cause for rejection of a bid.

(f) *Withdrawal of Bids.* Bids may be withdrawn by bidders prior to the time set for official opening. After time has been called, no bid may be withdrawn for a period of thirty-five days after the time and date of opening except as provided in O.C.G.A Section 13-10-22 (appreciable error in calculation of bid). Negligence or error on the part of any bidder in preparing his bid confers no right of withdrawal or modification of his bid after time has been called except as provided by Georgia law.

15. **Contract Award.** Award shall be made on a lump sum basis to the lowest responsive and responsible bidder. The lowest bid will be the bid whose price, after incorporating all accepted alternates, is the lowest responsive bid that was received from a responsible bidder. No bid may be withdrawn for a period of thirty-five days after time has been called on the date of opening except in accordance with the provisions of law.

16. **Owner's Rights Concerning Award.** The Owner reserves the right in its sole and complete discretion to waive technicalities and informalities. The Owner further reserves the right in its sole and complete discretion to reject all bids and any bid that is not responsive or that is over the budget, as amended. In judging whether the bidder is responsible, the Owner will consider, but is not limited to consideration of, the following:

(a) Whether the bidder or its principals are currently ineligible, debarred, suspended, or otherwise excluded from bidding or contracting by any state or federal agency, department, or authority;

(b) Whether the bidder or its principals have been terminated for cause or are currently in default on a public works contract;

(c) Whether the bidder can demonstrate sufficient cash flow to undertake the project as evidenced by a Current Ratio of 1.0 or higher;

(d) Whether the bidder can demonstrate a commitment to safety with regard to Workers' Compensation by having an Experience Modification Rate (EMR) over the past three years not having exceeded an average of 1.2; and

(e) Whether the bidder's past work provides evidence of an ability to successfully complete public works projects within the established time, quality, or cost, or to comply with the bidder's contract obligations.

17. **Owner's Right to Negotiate with the Lowest Bidder.** In the event *all* responsive and responsible bids are in excess of the budget, the Owner, in its sole and absolute discretion and in addition to the rights set forth above, reserves the right either to (i) supplement the budget with additional funds to permit award to the lowest responsive and responsible bid, or (ii) to negotiate with the lowest responsive and responsible bidder (after taking all deductive alternates) only for the purpose of making changes to the Project that will result in a cost to the Owner that is within the budget, as it may be amended.

18. **Contract Forms.** The contract forms, including the payment and performance bonds, shall be as set forth in the General Conditions, Section 7 – Forms.

[Remainder of Page Intentionally Left Blank]

BID REQUIREMENTS

BID FORM

To: OWNER _____ _____

_____ _____

Re: Project Name and No._____

Bid Date: _____

THE BID:

Bid. Having carefully examined the Specifications entitled PROJECT NO. {DESIGN PROFESSIONAL insert Project name and number}, and the Bidding Documents and Addendum (a) No.(s) A1, _____, as well as the Site and conditions affecting the Work, bidder hereby proposes to furnish all services, labor, materials, and equipment called for by them for the entire Work, in accordance with the aforesaid documents, for the sum of:

_____ Dollars ($ _____)

which sum is hereinafter called the Bid. The Bid shall be the amount of the Contract Sum executed between the Owner and the Contractor unless Alternates are accepted.

Alternates. None

Errors or Revisions. Prior to the bid opening date and hour, errors may be stricken or revisions may be made and corrections entered on this proposal form or on the bid envelope with sufficient clarity to be easily understood. All such annotations shall be binding on the bidder.

No Withdrawal. For and in consideration of the sum of $10.00, the receipt of which is hereby acknowledged, bidder and Owner agree that this bid may not be revoked or withdrawn after the time set for the opening of bids, except as provided in Georgia law, but is an irrevocable offer that shall remain open for acceptance for a period of thirty-five days following the time set for the opening of bids.

Execution of the Contract. If bidder is notified in writing by statutory mail of the acceptance of this bid within thirty-five days after time set for the opening of bids, bidder agrees to execute within ten days the Contract for the Work for the above stated Bid, as adjusted by the accepted Alternates, and at the same time to furnish and deliver to the Owner a Performance Bond and a Payment Bond on forms shown in Section 7 of the General Conditions of the Contract, both in an amount of equal to 100 percent of the Contract Sum.

Commencement and Completion of Work. Upon the Effective Date of the Contract, bidder agrees to commence all Preconstruction Activities. Upon issuance of a Proceed Order, bidder agrees to commence physical activities on the Site with adequate forces and equipment and to complete to Material Completion all work in **150** consecutive calendar beginning the day after the date of the Proceed Order.

Bid Bond. Enclosed herewith is a Bid Bond *(NO OTHER FORM ACCEPTABLE)* in the amount of _____ Dollars ($ _____) (being not less than five percent of the Bid). Bidder agrees that the above stated amount is the proper measure of liquidated damages that the Owner will sustain by bidder's failure to execute the Contract or to furnish the Performance and Payment Bonds should bidder's bid be accepted.

Obligation of Bid Bond. If this bid is accepted within thirty-five days after the date set for the opening of bids and bidder fails to execute the Contract within ten days after Notice of Successful Bid, or if bidder fails to furnish both Performance and Payment Bonds, the obligation of the Bid Bond will remain in full force and effect and the money payable thereon shall be paid into the funds of the Owner as liquidated damages for such failure; otherwise, the obligations of the Bid Bond will be null and void.

Bidder Certification

Certification under Oath. Under oath I certify that I am a principal or other representative of the bidder, and that I am authorized by it to execute the foregoing bid on its behalf; and further, that I am a principal person of the bidder with management responsibility for the construction for the bidder, and as such I am personally knowledgeable of all its pertinent matters. I further certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, or person submitting a bid for the same services, materials, labor, supplies, or equipment and is in all respects fair and without collusion or fraud. Bidder and its principals understand that collusive bidding is a violation of state and federal law and can result in fines, prison sentences, and civil damage awards. Bidder agrees to abide by all conditions of this bid.

BY: _____
Authorized *Signature* *(BLUE INK)*

_____
Printed Name Title

Sworn to and subscribed before me this ____ Day of _____ , 20_____.

_____
Notary Public

My commission expires: _____

(SEAL)

NOTE: THE NOTARY SEAL MUST BE APPLIED UNDER GEORGIA LAW, WHETHER OR NOT THE LAW OF THE STATE WHERE EXECUTED PERMITS OTHERWISE.

STATEMENT OF BIDDER'S QUALIFICATIONS:
(To be subscribed and sworn to before a notary public.)

The bidder submits the following statement of bidder's qualifications for consideration by the Owner.

Bidder's Name: _____
LEGAL NAME OF BUSINESS

Bidder's Address: _____
LEGAL BUSINESS ADDRESS (NO P.O. BOX, ***MUST*** BE PHYSICAL ADDRESS)

_____
CITY STATE ZIP

_____
MAILING ADDRESS IF DIFFERENT FROM ABOVE

Telephone Number: _____ _____
AREA CODE NUMBER

The full names of persons and firms interested in the foregoing bid as principals are as follows:

(1)_____
Circle One: President Partner Owner Other

(2)_____
Circle One: Vice President Secretary Partner Other

(3)_____
Circle One: Vice President Secretary Partner Other

Note: *If incorporated: The names of both the President and Corporate Secretary must be indicated. If a partnership, all partners must be indicated.*

Social Security Number or **FEIN:** _____

Contractor's Georgia License Type and Number: _____

Contractor's Federal Employment Verification Certification: ***(Must include completed Contractor Affidavit as found in Section 7 of the Contract)***

The Contractor is registered with, authorized to use, is using and will continue to use, the federal work authorization program throughout the term of the contract, and holds the following authorization:

User Identification Number: _____

Date of Authorization: _____

State Where Organized or Incorporated: _____

Plan of Organization: (Circle One) Proprietorship Corporation Partnership Joint Venture Other (Describe)

Years Engaged in Construction Contracting in Present Firm Organization: _____ years.

Bidder Hereby Certifies that bidder:

a. Has never refused to sign a contract at the original bid on a public works contract except as allowed under Georgia law.

b. Has never been terminated for cause on a public works contract.

c. Has had no (criminal or felony) convictions, suspensions, or debarments of the bidder, its officers, or its principals for building code violations, bid rigging, or bribery in the last ten years.

d. Is not and its organization or its principals are not debarred, suspended, declared ineligible, or otherwise excluded by any Federal or State department or agency from doing business with the Federal Government or a State.

e. Has insurance required by the Contract Documents in place or has arranged to obtain it from an insurer authorized to do business in the State of Georgia.

f. Has sufficient bonding capacity to obtain a payment and performance bond from a surety meeting the requirements of the Contract Documents and authorized to do business in the State of Georgia.

g. Has sufficient cash flow to perform this Project.

Remarks or explanations of the above paragraphs a through g:

_____

_____

_____

_____

Bidder Certification

Certification under Oath. Under oath I certify that I am a principal or other representative of the bidder, and that I am authorized by it to execute the foregoing Statement of Bidder's Qualifications is true and correct, including any explanation above and submitted under oath.

BY: _____
Authorized *Signature* *(BLUE INK PLEASE)*

_____
Printed Name Title

Sworn to and subscribed before me this ____ Day of _____ , 20_____.

_____
Notary Public

My commission expires: _____

(SEAL)

NOTE: THE NOTARY SEAL MUST BE APPLIED UNDER GEORGIA LAW, WHETHER OR NOT THE LAW OF THE STATE WHERE EXECUTED PERMITS OTHERWISE.

Statistical Information. This request is made for statistical purposes only.

PLEASE INDICATE BELOW WHICH OF THE FOLLOWING DESCRIPTIONS APPLY TO YOUR COMPANY:

____ MINORITY BUSINESS ENTERPRISE (MBE) – One of the following statements describes this business: **a)** Owned by a member of a minority race; or **b)** a partnership of which a majority of interest is owned by one or more members of a minority race; or **c)** a public corporation of which a majority of the common stock is owned by one or more members of a minority race. A member of a minority race is defined as a person who is a member of a race that comprises less than fifty percent of the total population of the State of Georgia. For recordkeeping purposes, this includes, but is not limited to, persons who are Black, Hispanic, Asian-Pacific American, Native American, or Asian-Indian American.

____ GEORGIA MINORITY BUSINESS ENTERPRISE (GMBE) – Business meets the definition of a minority-owned business and, in addition, meets the following criteria: **a)** was organized in the State of Georgia; or **b)** reports income from the business for Georgia Income Tax purposes; or **c)** minority stockholders report earnings for Georgia Minority Business Enterprise. For more information, please contact the Board of Regents' Office of Business Development by e-mail at BusinessDevelopment@usg.edu.

____ NEITHER DESCRIPTION APPLIES TO YOUR COMPANY.

BID REQUIREMENTS
BID SECURITY FORM

NOTE TO CONTRACTOR: Use of Surety's standard Bid Bond form is acceptable as long as it substantially complies with the following:

KNOW ALL BY THESE PRESENTS, That we, {Insert Contractor's Legal Name and Address} as Principal, hereinafter called the Principal, and {Insert Legal Name and Address of Surety}, a corporation duly organized under the laws of the State of {Insert State of Corporate Organization}, as Surety, hereinafter called the Surety, are held and firmly bound unto:

OWNER: _____

Attention: _____

Phone Number: _____

Facsimile Number: _____

as Obligee, hereinafter called the Obligee in the sum of _____ (Not less than five percent of the Bid) Dollars ($ _____), for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a Bid for _____;
Heating Upgrade for Atkinson Hall

NOW, THEREFORE, if the Obligee shall accept the Bid of the Principal and (1) the Principal shall enter into a Contract with the Obligee in accordance with the terms of such Bid, and the Principal shall execute the Contract and give such bond or bonds as may be specified in the Bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) in the event of the failure of the Principal to enter such Contract and give such bond or bonds, and the Principal shall pay to the Obligee the difference not to exceed the difference hereof between the amount specified in said Bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said Bid; then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this _____ Day of _____, 20___

Name of Contractor: _____
Principal

_____
Witness

By: _____ (Seal)

_____
Title

Name of Surety: _____
Surety

_____
Witness

By: _____ (Seal) (*)

(*) Attach Power of Attorney

SECTION 7 – FORMS

FORMS INDEX:

PERFORMANCE BOND

Bond No. _____

Project No. Heating Upgrade for Atkinson Hall

KNOW ALL MEN BY THESE PRESENTS:

That _____ as principal (hereinafter referred to
(Legal Name and Address of the Contractor)
as "Contractor"), and _____ as surety (hereinafter referred to
(Legal Title and Address of Surety)
as "Surety"), are held and firmly bound unto the Board of Regents of the University System of Georgia as Obligee (hereinafter referred to as "Owner") in the amount of **_____ and No/100 Dollars ($ .00),** to which payment Contractor and Surety bind Themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above bounden Principal has entered into a contract with the Owner bearing date of **Month, Day, Year** for: **Heating Upgrade for Atkinson Hall, Georgia College & State University, Milledgeville, Georgia** in accordance with drawings and specifications prepared by: **Andrews, Hammock & Powell, Inc.** which said contract is incorporated herein by reference and made a part hereof, and is hereinafter referred to as the Contract.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Contractor shall promptly and faithfully perform and comply with the terms and conditions of said contract; and shall indemnify and save harmless the Owner against and from all cost, expenses, damages, injury or loss to which said Owner may be subjected by reason of any wrongdoing, including patent infringement, misconduct, want of care or skill, default or failure of performance on the part of said Principal, his agents, subcontractors or employees, in the execution or performance of said contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

(1) The said Surety to this bond, for value received, hereby stipulates and agrees that no change or changes, extension of time or extensions of time, alteration or alterations or addition or additions to the terms of the contract, or to the work to be performed thereunder, or the specifications or drawings accompanying same, or the exercise of the Owner's right to do work pursuant to Articles 1.3.7, 1.7.8, or 5.3.5, or Paragraphs 3.4.1.4 or 5.3.2.3, shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change or changes, extension of time or extensions of time, alteration or alterations or addition or additions to the terms of the contract or to the Work or to the specifications or drawings. In addition, the Surety to this bond, for value received, hereby agrees to the provisions of Article 1.5.1, including Paragraph 1.5.1.3 for increases in the penal amount of this bond, and waives notice from the Owner of any such changes.

(2) If pursuant to the Contract Documents the Contractor shall be declared in default by the Owner under the aforesaid Contract and the Owner has terminated the Contractor's right to complete the Contract, the Surety shall promptly perform this bond agreement in accordance with its terms and conditions. If Surety chooses to investigate, Owner shall cooperate with the Surety in its investigation and shall make all public project records available for inspection by Surety at no cost to Owner. It shall be the duty of the Surety to give an unequivocal notice in writing to the Owner, within twenty-five (25) days after receipt of such a declaration of default, of the Surety's election to either remedy the default or defaults promptly or to perform the Contract promptly, time being of the essence. In said notice of election, the Surety shall indicate the date on which the remedy or performance will commence, and it shall then be the duty of the Surety to give prompt notice in writing to the Owner immediately upon completion of (a) the remedy and/or correction of each default, (b) the remedy and/or correction or each item of condemned work, (c) the furnishing of each omitted item of work, and (d) the performance of the contract. The Surety shall not assert its Principal as justification for its failure to give notice of election or for its failure to promptly remedy the default or defaults or perform the Contract.

(3) It is expressly agreed by the Principal and the Surety that the Owner, if he desires to do so, is at liberty to make inquiries at any time of subcontractors, laborers, materialmen, or other parties concerning the status of payments for labor, materials, or services furnished in the prosecution of the work.

(4) No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the legal successors of the Owner.

(5) For the purposes of this bond, the name and address of the **responsible official of the Surety's claims department**, to whom correspondence and telecommunications may be addressed and/or with whom business concerning this bond may be conducted will be as follows:

NAME _____

TITLE _____

ADDRESS _____

CITY_____ STATE _____ ZIP CODE _____

TELEPHONE _____

(6) Further, this bond shall be the Performance Bond furnished under O.C.G.A. §§ 13-10-2, 13-10-20 and shall be subject to increase in the penal amount of the bond pursuant to such statutes and Article 1.5.1 of the Contract.

(7) No action can be instituted on this bond after one year from the date of Final Completion as determined pursuant to Article 6.2.2.

SIGNED AND SEALED THIS _____ DAY OF _____, 20_____.

ATTEST: (NAME OF Contractor)

_____ By_____
Secretary(*) President

_____
(SURETY) (*)(*)

_____
(TITLE)

(*) Please apply seal of Corporation over Secretary's Signature.
(*)(*) Please apply seal of Surety and arrange for countersignature by a "Georgia Licensed Agent" of Surety pursuant to O.C.G.A. §33-23-5. Kindly show title of the aforesaid agent as "Georgia Licensed Agent."

(*) Attach Power of Attorney

PAYMENT BOND

Bond No. _____

Project No. Heating Upgrade for Atkinson Hall

KNOW ALL MEN BY THESE PRESENTS:

That_____ as Principal (hereinafter referred to as the
(Legal Title and Address of the Contractor)

"Principal") and _____ as Surety (hereinafter referred
(Legal Name and Address of the Surety)

to as "Surety"), are held and firmly bound unto the BOARD OF REGENTS OF THE UNIVERSITY SYSTEM OF GEORGIA as Obligee (hereinafter referred to as "Owner") for the use and benefit of claimants defined, hereinafter in the amount of **Dollars ($)**to which payment Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns jointly and severally, firmly by these presents.

WHEREAS, the above bounden Principal has entered into a contract with Owner dated **Month, Day, Year**for **Heating Upgrade for Atkinson Hall**, **Georgia College & State University**, **Milledgeville, Georgia** in accordance with the drawings and specifications prepared by: **Andrews, Hammock & Powell, Inc.** which contract is incorporated herein by reference and made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and materials supplied in the prosecution of the work provided for in said Contract, then this obligation shall be void, otherwise it shall remain in full force and effect subject, however, to the following conditions:

(1) The said Surety to this bond, for value received, hereby stipulates and agrees that no change or changes, extension of time or extensions of time, alteration or alterations or addition or additions to the terms of the contract or to the work to be performed thereunder, or the specifications or drawings accompanying same, or the exercise of the Owner's right to do work pursuant to Articles 1.3.7,1.7.8 or 5.3.5 or Paragraphs 3.4.1.4 or 5.3.2.3, shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change or changes, extension of time or extensions of time, alteration or alterations or addition or additions to the terms of the contract or to the Work or to the specifications or drawings. In addition, the Surety to this bond, for value received, hereby agrees to the provisions of Article 1.5.1, including Paragraph 1.5.1.3, for increases in the penal amount of this bond and waives notice from the Owner of any such changes.

(2) A claimant is defined as any subcontractor and any person supplying labor, materials, machinery, or equipment in the prosecution of the work provided for in said contract.

(3) Every person entitled to the protection hereunder and who has not been paid in full for labor or materials furnished in the prosecution of the work referred to in said bond before the expiration of a period of ninety (90) days after the day on which the last of the labor was done or performed by him, or materials or equipment or machinery was furnished or supplied by him for which claim is made, shall have the right to sue on such payment bond for the amount, or the balance thereof, unpaid at the time of the commencement of such action and to prosecute such action to final execution and judgment for the sum or sums due him, provided, however, that any person having direct contractual relationship with a subcontractor, but no contractual relationship express or implied with the Contractor furnishing said payment bond shall have (a) given written notice to said Contractor within ninety (90) days from the day on which such person did or performed the last of the labor, or furnished the last of the materials or machinery or equipment for which such claim is made stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished or supplied or for whom the labor was performed or done; and (b) if the Contractor has filed a Notice of Commencement in accordance with the requirements of O.C.G.A. §13-10-62 and Articles 4.3.2 of the contract, given to said contractor a written Notice to Contractor within 30 days from the filing of the Notice of Commencement or 30 days following the first delivery of labor, materials, machinery or equipment, whichever is later, setting forth:

A) The name, address, and telephone number of the person providing labor, material, machinery, or equipment;

B) The name and address of each person at whose instance the labor, material, machinery or equipment is being furnished;

C) The name and the location of the public work; and

D) A description of the labor, material, machinery, or equipment being provided and, if known, the contract price or anticipated value of the labor, material, machinery, or equipment to be provided or the amount claimed to be due, if any.

It is provided further that nothing contained herein shall limit the right of action to said 90-day period. Notice may be served by the depositing of a notice, certified mail, postage paid, duly addressed to the Contractor at any place he maintains an office or conducts his business, or his residence, in any post office or branch post office or any letter box under the control of the Post Office Department or notice may be served by statutory mail pursuant to O.C.G.A. §9-10-12 or in any manner in which the sheriffs of Georgia are authorized by law to serve summons or process. Every suit instituted under this section shall be brought in the name of the claimant without Owner being made a party thereof. The official who has custody of said bond is authorized and directed to furnish, to any person making application thereof who submits an affidavit that he has supplied labor or materials for such work and payment therefore has not been made, or that he is being sued on any such bond, a copy of such bond and the contract for which it

was given, certified, by the official who has custody of said bond and contract shall be admitted in evidence without further proof. Applicants shall pay for such certified statements and such fees as the official fixes to cover the cost of preparation thereof, but in no case shall the fixed fee exceed the fees that the clerks of the superior courts are permitted to charge for similar copies.

(4) It is expressly agreed by the Principal and the Surety that the Owner, if he desires to do so, is at liberty to make inquiries at any time of subcontractors, laborers, materialmen, or other parties concerning the status of payments for labor, materials, or services furnished in the prosecution of the work.

(5) For the purposes of this bond, the name and address of the **responsible official of the Surety's claims department**, to whom correspondence and telecommunications may be addressed and/or with whom business concerning this bond may be conducted will be as follows:

NAME _____

TITLE _____

ADDRESS _____

CITY _____ STATE _____ ZIP CODE _____

TELEPHONE _____

(6) Further, this bond shall be the Payment Bond furnished under O.C.G.A. §§ 13-10-1, 13-10-60 *et seq.* and shall be subject to increase in the penal amount of the bond pursuant to such statutes and Article 1.5.1 of the Contract.

(7) No action can be instituted on this bond after one year from the date of Final Completion as determined pursuant to Article 6.2.2.

SIGNED AND SEALED THIS _____ DAY OF _____, 20_____.

ATTEST: (NAME OF Contractor)

_____ By _____
Secretary(*) President

_____
(SURETY) (*)(*)

_____
(TITLE)

(*) Please apply seal of Corporation over Secretary's Signature.
(*)(*)Please apply seal of Surety and arrange for countersignature by a "Georgia Licensed Agent" of Surety pursuant to O.C.G.A. §33-23-5. Kindly show title of the aforesaid agent as "Georgia Licensed Agent."

(*) Attach Power of Attorney

GEORGIA SECURITY AND IMMIGRATION COMPLIANCE ACT AFFIDAVIT(S)

"Contractor" in the following Affidavits shall mean "General Contractor"/"Contractor" for the purpose of compliance with O.C.G.A. § 13-10-91, (b).

For the purpose of completing the attached Affidavits, please insert the following:

- "Name of Public Employer" shall mean "Board of Regents of the University System of Georgia, Owner, for the use and benefit of **Georgia College & State University**, Using Agency"
- "Name of Project" shall mean "Project No. **Heating Upgrade for Atkinson Hall**"

Contractor Affidavit under O.C.G.A. § 13-10-91(b)(1)

By executing this affidavit, the undersigned contractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services on behalf of Board of Regents of the University System of Georgia for the use and benefit of **Georgia College & State University**, Using Agency (public employer) has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned contractor will continue to use the federal work authorization program throughout the contract period and the undersigned contractor will contract for the physical performance of services in satisfaction of such contract only with subcontractors who present an affidavit to the contractor with the information required by O.C.G.A. § 13-10-91(b). Contractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

_____
Federal Work Authorization User Identification Number

_____
Date of Authorization

_____
Name of Contractor

Heating Upgrade for Atkinson Hall
Name of Project

Board of Regents of the University System of Georgia
For the use and benefit of **Georgia College & State University**
Name of Public Employer

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

Executed on _____, ___, 20__ in _____(city), _____(state).

_____
Signature of Authorized Officer or Agent

_____
Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF _____,20__.

_____
NOTARY PUBLIC

My Commission Expires:
_____

Subcontractor Affidavit under O.C.G.A. § 13-10-91(b)(3)

By executing this affidavit, the undersigned subcontractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services under a contract with _____ (name of contractor) on behalf of Board of Regents of the University System of Georgia for the use and benefit of **Georgia College & State University**, Using Agency (public employer) has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned subcontractor will continue to use the federal work authorization program throughout the contract period and the undersigned subcontractor will contract for the physical performance of services in satisfaction of such contract only with sub-subcontractors who present an affidavit to the subcontractor with the information required by O.C.G.A. § 13-10-91(b). Additionally, the undersigned subcontractor will forward notice of the receipt of an affidavit from a sub-subcontractor to the contractor within five business days of receipt. If the undersigned subcontractor receives notice that a sub-subcontractor has received an affidavit from any other contracted sub-subcontractor, the undersigned subcontractor must forward, within five business days of receipt, a copy of the notice to the contractor. Subcontractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

_____
Federal Work Authorization User Identification Number

_____
Date of Authorization

_____
Name of Subcontractor

Heating Upgrade for Atkinson Hall
Name of Project

Board of Regents of the University System of Georgia
For the use and benefit of **Georgia College & State University**
Name of Public Employer

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

Executed on _____, ___, 20__ in _____(city), _____(state).

_____
Signature of Authorized Officer or Agent

_____
Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF _____,20__.

_____
NOTARY PUBLIC

My Commission Expires:
_____

Sub-subcontractor Affidavit under O.C.G.A. § 13-10-91(b)(4)

By executing this affidavit, the undersigned sub-subcontractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services under a contract for _____ (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract) and _____ (name of contractor) on behalf of Board of Regents of the University System of Georgia for the use and benefit of **Georgia College & State University**, Using Agency (public employer) has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned sub-subcontractor will continue to use the federal work authorization program throughout the contract period and the undersigned sub-subcontractor will contract for the physical performance of services in satisfaction of such contract only with sub-subcontractors who present an affidavit to the sub-subcontractor with the information required by O.C.G.A. § 13-10-91(b). The undersigned sub-subcontractor shall submit, at the time of such contract, this affidavit to _____ (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract). Additionally, the undersigned sub-subcontractor will forward notice of the receipt of any affidavit from a sub-subcontractor to _____ (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract). Sub-subcontractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

_____
Federal Work Authorization User Identification Number

_____
Date of Authorization

_____
Name of Sub-subcontractor

Heating Upgrade for Atkinson Hall
Name of Project

Board of Regents of the University System of Georgia
For the use and benefit of **Georgia College & State University**
Name of Public Employer

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

Executed on _____, ___, 20__ in _____(city), _____(state).

_____
Signature of Authorized Officer or Agent

_____
Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF _____,20__.

_____
NOTARY PUBLIC
My Commission Expires:

_____

NON-INFLUENCE AFFIDAVIT

COUNTY OF _____

STATE OF _____

I do solemnly swear on my oath that as to the Contract dated_____, 20_____, between _____
(NAME OF CONTRACTOR)

and the Owner, I have no knowledge of the exertion of any influence or the attempted exertion of any influence on the firm on behalf of which this affidavit is made in any way, manner, or form in the purchase of materials, equipment, or other items involved in construction, manufacture, or employment of labor under the aforesaid Contract by any employee, officer, or agent of the Owner, or any person connected with the State Government of Georgia in any way whatsoever.

This _____ day of _____, 20_____.

_____(L.S.)
Signature

_____
Title

_____
Firm

COUNTY OF _____

STATE OF _____

Personally before me, the undersigned authority, appeared_____
(NAME OF PERSON SIGNING THE AFFIDAVIT)
who is known to me to be an official of the firm of _____,
(NAME OF CONTRACTOR)
and who, after being duly sworn, stated on his oath that he had read the above statement and that the same is true and correct.

_____
Notary Public

My Commission expires _____

This_____ day of _____, 20____.

STATUTORY AFFIDAVIT

COUNTY OF _____ STATE OF _____

FROM: _____
Contractor

TO: _____
Owner

Re: Contract entered into the _____ day of _____, 20____, between the above-mentioned parties for the construction

of Project No. _____ located at _____

KNOW ALL MEN BY THESE PRESENTS:

1. The undersigned hereby certifies that all work required under the above Contract has been performed in accordance with the terms thereof, that all Subcontractors, Suppliers, Trade Contractors, mechanics, and laborers have been paid and satisfied in full, or will be paid and satisfied in full out of the proceeds of this payment as set forth in O.C.G.A. §13-10-80, and that there are no outstanding claims of any character [including disputed claims or any claims to which the Contractor has or will assert any defense] arising out of the performance of the Contract which have not been paid and satisfied in full except as listed herein below:.....

Instructions to Contractor- ENTER THE WORD "NONE" OR LIST THE NAMES OF CLAIMANTS

2. The undersigned further certifies that to the best of his knowledge and belief there are no unsatisfied claims for damages resulting from injury or death to any employees, Subcontractors, or the public at large arising out of the performance of the contract, or any suits or claims for any other damage of any kind, nature, or description which might constitute a lien upon the property of the Owner.

3. The undersigned makes this affidavit for the purpose of receiving final payment in full settlement of all claims against the Owner arising under or by virtue of the contract, and acceptance of such payment is acknowledged as a release of the Owner from any and all claims arising under or by virtue of the contract.

This _____ day of _____, 20_____.

_____(L.S.)
Signature

_____
Title

_____
Firm

COUNTY OF _____ STATE OF _____

Personally before me, the undersigned authority, appeared_____
(NAME OF PERSON SIGNING THE AFFIDAVIT)

who is known to me to be an official of the firm of _____,
(NAME OF CONTRACTOR)

and who, after being duly sworn, stated on his oath that he had read the above statement and that the same is true and correct.

_____
Notary Public

My Commission expires _____

This_____ day of _____, 20____.

FIVE YEAR BOND ON ROOFS AND WALLS

NOT APPLICABLE

STATE OF GEORGIA

COUNTY OF _____

Firmly Bound. Know all men by these presents, that we, _____ ("Contractor") as Principal, and (Name of Surety), as Surety, are held and firmly bound unto _____,
(Insert Name of Owner)
Owner, in the sum of_____ Dollars ($_____) for the payment of which well and truly to be made and done, we bind ourselves, our executors and administrators, our successors and assigns, jointly and severally, by these presents.

Condition of Obligation. The condition of the above obligation is such that WHEREAS Contractor has entered into a Contract with Owner dated_____ (enter date of contract), for construction of Project No._____.

Warranty. WHEREAS, the said Contractor warrants with respect to the said work that for a period of five years from the date of the execution of the final certificate of the Design Professional, the roofs of the building (or buildings) and roofs of passages, including but not limited to the roof envelope, including but not limited to the roof decking; deck sheathing; material used as a roof base or insulation over which roof is applied; roofing materials; promenade decks or any other work on the surface of the roof; flashing; base flashing; counter flashing; metal work, gravel stops; or roof expansion joints shall be absolutely watertight and free from all leaks. At no expense to the Owner, the Contractor will make repairs to any defects that may develop in the work including but not limited to: blisters, exposed felts, ridges, wrinkles, splits, warped insulation, and loose flashing, in a manner compatible to the system and acceptable under industry standards and in accordance with the construction specifications. The Contractor also warrants that for the same five-year period the walls of the building (or buildings) and building envelope, including but not limited to: vertical and/or horizontal expansion joints, below and/or above grade waterproofing, below and/or above grade damp-proofing, thru-wall flashing, damp course flashing and waterproofing of joints at openings in walls including but not limited to door perimeters, window perimeters, vents and pipe openings shall be absolutely watertight and free from all leaks, seepage or dampness, and that he shall, at no expense to the Owner, make repairs to any defects that may develop in the work in a manner compatible to the system and acceptable under industry standards and in accordance with the construction specifications, Provided, however: That the following are excluded from the warranty:

(a) Defects or failures resulting from abuse by the Owner, upon presentation of competent evidence of same by the Contractor.

(b) Defects in design that the said Contractor shall produce competent evidence of having had provided clear written notice in writing to the Owner prior to commencing installation of the Work, except, however, that the Contractor shall not be responsible, insofar as liability under this bond is concerned, for bringing to the attention of the Owner defects in design involving failure of only the following three structural elements:

(1) Structural Frame
(2) Load bearing walls
(3) Foundations

nor shall the Contractor be responsible for correction of leaks resulting from said failure.

(c) Damage caused by fire, tornado, hail, hurricane, acts of God, wars, riots, or civil commotion upon presentation of competent evidence of same by the Contractor..

(d) The Contractor is not an insurer nor is he a guarantor of the design. Any other provisions of this bond to the contrary notwithstanding, the Contractor shall not be required to remedy any errors or omissions of design.

Leaks or Defects. WHEREAS the said **Contractor** agrees that should any leaks or defects occur in the roof envelope or wall envelope of the said (Name and Number of Project) the said **Contractor** will promptly remedy the said leaks or defects and pay for any damage to other work of said Project resulting therefrom, except, however, that when this instrument is executed by a Trade Contractor this Contract, shall, insofar as the Trade Contractor is concerned, extend only to the work executed by said Trade Contractor.

Notice to Surety. If the Contractor shall have been given notice to remedy leaks or defects pursuant to the Contract Documents and has been declared in default by the Owner and the Owner has terminated the Contractor's right to complete the remedy, the Surety shall

be notified in writing and shall promptly perform this bond agreement in accordance with its terms and conditions. If Surety chooses to investigate, Owner shall cooperate with the Surety in its investigation and shall make all public project records available for inspection by Surety at no cost to Owner. It shall be the duty of the Surety to give an unequivocal notice in writing to the Owner, within twenty-five (25) days after receipt of such notice, of the Surety's election to either remedy the leaks and defects promptly, time being of the essence. In said notice of election, the Surety shall indicate the date on which the remedy or performance will commence, and it shall then be the duty of the Surety to give prompt notice in writing to the Owner immediately upon completion of the remedy and/or correction of the leaks or defects. The Surety shall not assert its Principal as justification for its failure to give notice of election or for its failure to promptly remedy the leaks or defects.

Full Force and Effect. NOW, THEREFORE, the condition of this obligation is such that if the Contractor_ shall in all things promptly and faithfully perform and comply with the terms and conditions hereinbefore set forth, then this obligation shall be null and void; otherwise, it shall remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed this _____ day of _____, 20___.

_____ WITNESS
Principal

By:_____ _____

TITLE_____ _____

_____ WITNESS
Surety

By:_____ _____

TITLE_____ _____

(*) Attach Power of Attorney

Instructions for execution by Contractor

(a) If the firm is a partnership, all members of the partnership must execute.
(b) If the firm is a corporation, the president must sign, the secretary must attest, and the Seal of Corporation must be affixed.
(c) If the firm operates as a sole proprietorship, the proprietor must execute.

SPECIMEN CERTIFICATE OF MANUFACTURER

INSTRUCTIONS FOR PREPARATION OF CERTIFICATE: To be acceptable, the certificate must be prepared in the form indicated by this specimen on the official letterhead of the manufacturer. No portions of the certificate may be omitted. Attached is a copy of the Contract provision under which the certificate is required. The Authority needs only one copy of the certificate. If equipment of a manufacturer is not installed in strict compliance with the recommendations of the manufacturer or if in the design of the work the equipment is not applied in strict compliance with the recommendations of the manufacturer, a letter from the manufacturer should be forwarded to the Contractor [with copies to the Design Professional and the Owner] setting forth a list of the deviations from the recommendations of the manufacturer and stating what remains to be done in order to bring the work into strict compliance with the recommendations of the manufacturer. Prior to calling upon the representative of the manufacturer for performance of the services necessary to enable him to execute a certificate in accordance with this specimen, it is the obligation of the Contractor to have installed the work in strict compliance with the recommendations of the manufacturer [See Article 2.2.4 of the Contract], and it is likewise the obligation of the Contractor to have put the equipment in good operating condition in absolute and final readiness for the "start-up," "testing," and "placing into operation" as defined herein below by the representative of the manufacturer.

Date:_____

Insert name and address of Owner

Re: Certificate of [JOHN DOE CORPORATION] that equipment or components furnished by it has [or have, as the case may be] been installed in strict compliance with its recommendations and is [or are, as the case may be] operating properly at PROJECT NO._____

Gentlemen:

1. We certify through our duly authorized and acting agent that the following item [or items, as the case may be] furnished by us to the Project named in the caption was [or were, as the case may be] started up, tested, and placed in operation by our authorized field representative on [enter the date on which the field representative performed the start-up, test, and placing into operation] and is [or are, as the case may be] operating properly:

[List the item or items furnished to the job. Show catalogue number or numbers.]

2. We certify further that the aforesaid equipment was installed in strict compliance with our recommendations as published by us in the following document [or documents, as the case may be]:

[Insert the date, name, or other positive means of identifying the exact document or documents in which the recommendations for installation and use of the item or items are published.] (*)

3. A copy of the aforesaid document(s) is (are) attached hereto.

This _____ day of_____, 20____

JOHN DOE CORPORATION

By:_____
Authorized Representative

(*) The date must be shown
[See Article 6.4.1.2.5
DEFINITIONS:
l. "Start-up" is defined as putting the equipment into action.
2. "Testing" is defined as performing such testing as is stipulated in the Contract Documents to be performed.
3. "Placing into operation" is defined as operating the equipment for a sufficient period of time for the determination to be made that it is performing properly.

INSTRUCTIONS TO PRODUCING AGENT: COMPLETE THE SHADED PORTIONS OF THIS CERTIFICATE OR SIMILAR FORM AND RETURN TO THE INSURED, WITH ADDITIONAL INSURED ENDORSEMENTS ATTACHED. NO CONDITION, TERM, QUALIFICATION, LIMITATION, EXCEPTION, EXEMPTION, MODIFICATION, OR PROVISO SHALL APPEAR ON THE CERTIFICATE.

Certificate of Insurance

Name, Address and Telephone Number of Producing Agent	**PROJECT NO.**: **HEATING UPGRADE FOR ATKINSON HALL** **PROJECT NAME: Heating Upgrade for Atkinson Hall, Georgia College & State University, Milledgeville, Georgia**
Name and Address of Insured Contractor (Contractor)	**Certificate Holder(Owner)**: Board of Regents of the University System of Georgia 270 Washington Street, SW, 6th Floor Atlanta, Georgia 30334 ***Attn: Director of Contracts & Services, Office of Facilities***

Type of Insurance	Policy No.	Company Affording Coverage	Policy Expiration Date	Limits
Commercial General Liability(1993 ISO Occurrence Form or its equivalent); Includes XCU Coverage				Each Person $1,000,000.00 Each Occurrence $1,000,000.00 Products-Co./Op Agg $1,000,000.00 Personal & Adv injury $1,000,000.00 Contractual $1,000,000.00 General Aggregate $2,000,000.00
Commercial Business Automobile Liability				Bodily Injury $1,000,000.00 Property Damage $1,000,000.00 Combined Single Limit $1,000,000.00
Commercial Umbrella Liability				Each Occurrence $2,000.000.00 Aggregate $4,000,000.00
Workers Compensation				W C Statutory Limits
Employers' Liability				Each Accident $1,000,000.00 Disease Each Employee $1,000,000.00 BI - Disease-Aggregate $1,000,000.00
Builders Risk written on 1991 Cause of Loss-Special Form or its equivalent OR **Installation Floater** (for other than new construction)				Cost of Project

The insured contractor has provided the contract provisions concerning insurance to the Undersigned, and the Undersigned had reviewed the insurance coverages required for the project referenced above and makes the following certifications, which shall serve to bind the various insurance carriers as follows:

1. Such insurance as is herein certified (i) are written in accordance with the company's regular policies and endorsements, subject to the company's applicable manuals or rules and rates in effect, (ii) have been issued to the insured named above, and (iii) are in force at this time.
2. With the exception of the Workers Compensation policy, the Officers, Members, Agents, & Employees of the Owner and the State of Georgia are included as additional insureds as their interests may appear and a copy of the additional insured endorsement(s) is attached hereto. The undersigned certifies that he has so notified each Insurer that Georgia law requires that the Attorney General of Georgia shall represent and defend the state entities and Indemnities named herein remains in full force and effect and is not waived by issuance of any policy of insurance Disease Each Employee $1,000,000.00
BI - Disease-Aggregate $1,000,000.00.
3. Each policy either provides or has been endorsed to meet Georgia law that the policy shall not be canceled, changed, allowed to lapse, or allowed to expire for any reason until thirty (30) days (10 days for non-payment of premium) after the Certificate holder has received written notice thereof as evidenced by return receipt of certified or overnight letter.

Authorized Representative: _____ Date: _____

Typed Name: _____

THIS FORM IS FOR OPTIONAL USE TO RELEASE TO THE CONTRACTOR FUNDS WITHHELD FROM A PAY APPLICATION IN THE EVENT A SUBCONTRACTOR FILES A CLAIM AGAINST THE CONTRACT BALANCE HELD BY THE OWNER THAT REMAINS UNRESOLVED. THIS IS A SUBORDINATE DOCUMENT TO THE PAYMENT BOND FOR THE PROJECT, AND IS CALCULATED AGAINST THE PENAL AMOUNT OF THAT PAYMENT BOND. THERE ARE OTHER METHODS THAT MAY BE USED TO REMEDY SUCH SITUATIONS, HOWEVER, THIS FORM IS EFFECTIVE WHEN NONE OF THE PARTIES ARE ABLE TO REACH AGREEMENT UPON THE CLAIM.

BOND TO DISCHARGE CLAIM

WHEREAS, _____ (hereinafter referred to as "Claimant" has filed a claim against _____ (the "Contractor", hereinafter referred to as "Principal") on the following contract:

WHEREAS, the undersigned Principal and Surety have issued Payment Bond No. _____ (the "Primary Bond") to the Owner, as Obligee, on the Contract dated _____ for Project _____ _____ ;

WHEREAS, the undersigned Principal and Surety dispute the Claimant's entitlement to all or part of the claim and expressly reserve all rights and defenses available at law in connection therewith;

WHEREAS, _____ as Principal and _____ as Surety, desire to continue to receiving payments from the Owner for work done on the above referenced project,

NOW THEREFORE, in consideration of these premises, the undersigned Principal and Surety do hold themselves firmly bond unto _____ as Claimant, in the total amount of _____ dollars ($_____), representing double the amount of the claim.

The condition of this Bond to Discharge Claim is such that should the undersigned Principal or Surety pay to the Claimant the sum that may be found to be due to the Claimant upon the trial of any action that may be filed by said Claimant, or if Principal or Surety pay to the Claimant a sum agreeable to Claimant and Claimant accepts such payment, then this Bond shall be void; otherwise to remain in full force and effect.

The penal amount of the Primary Bond is conditionally reduced by the amount of this Bond to Discharge Claim, and upon payment of any sums to the Obligee under this Bond to Discharge Claim, the penal amount of the Primary Bond is reduced *instanter* by the amount of such payment.

No action can be instituted on this bond after one year from the date of Final Completion as determined pursuant to Article 6.2.2 of the Contract.

IN WITNESS WHEREOF, the said Principal and Surety have set their hands and seals this _____ day of _____, 20___.

_____
Principal

by:_____

_____
Surety

by:_____
Attorney-in-Fact

_____
Type Name Above

CHANGE ORDER FORMAT
(Lump Sum)

CHANGE ORDER No. _____

Project Name: _____
Project Number: _____

Owner

1. Submission of this Change Order for consideration was authorized by letter from the Owner, dated _____, 20__, Incumbrance Record No. _____.

2. The changes hereinafter described are applicable to the Contract for the construction of the above-referenced Project and amend the Contract Documents.

3. Description of Change:

4. This Change Order is deemed necessary and originated with the (Design Professional) (Owner) (Contractor) (Using Agency). *(Indicate applicable entity.*)

5. This Change Order is necessary to:

6. The amount of the Change Order was determined by:

Choose one:
a. Estimate and acceptance in lump sum.
b. Unit prices stated in contract or subsequently agreed upon.
c. Cost and percentage as described in general conditions.

7. A memorandum is attached showing cost breakdown of labor and materials by unit and quantities as prepared by the Contractor and checked by the Contract Compliance Specialist and Program Manager (if any).

8. We have verified the quantity and quality of all materials shown on the memorandum. We have verified that all prices are reasonable and do not exceed current costs for like services or materials, and we have verified that the quality of the materials meets the requirements of the Contract Documents.

9. The contractor shall be allowed _____ additional calendar days for completion. The Material Completion and Occupancy Date is: _____ .

10. The Contract Sum shall be *(increased) (decreased)* by $ _____ on account of this change.

11. The payment and extension of time, if any, provided by this Change Order constitutes compensation in full to the Contractor and its Subcontractors, Suppliers, and Trade Contractors for all costs and markups, directly and indirectly attributable to the changes ordered herein, and for all delays or time related costs thereto and for any acceleration costs for performance of changes within the time stated and to be completed by the Material Completion and Occupancy Date and for any claims related thereto against the Owner and the Design Professional, and design consultants.

APPROVED AND AGREED BY CONTRACTOR:
LEGAL GC Firm Name

By: _____

_____
(Print Name/Title)

Date approved by Contractor: _____

RECOMMENDED FOR OWNER'S ACCEPTANCE
DESIGN PROFESSIONAL: Andrews Hammock & Powell, Inc.

By: _____

_____
(Print Name/Title)

Date approved by Design Professional: _____

APPROVED AND AGREED BY USING AGENCY:
GEORGIA COLLEGE & STATE UNIVERSITY

By: _____

_____
(Print Name/Title)

Date approved by Using Agency: _____

APPROVED AND AGREED BY OWNER:
BOARD OF REGENTS OF THE UNIVERSITY

By: _____

_____
(Print Name/Title)

Date approved by Owner: _____

CHANGE ORDER FORMAT
(Force Account or Indeterminate Units)

CHANGE ORDER No. _____

Project Name: _____
Project Number: _____

Owner

1. Submission of this Change Order for consideration was authorized by letter from the Owner, dated _____, 20__, Incumbrance Record No. _____.

2. The changes hereinafter described are applicable to the Contract for the construction of the above-referenced Project and amend the Contract Documents..

3. Description of Change:

4. This Change Order is deemed necessary and originated with the (Design Professional) (Owner) (Contractor) (Using Agency). *(Indicate applicable entity.*)

5. This Change Order is necessary to:

6. The Maximum Allowable Cost of the Change Order was estimated by:

Choose one:
a. Estimate in lump sum.
b. Unit prices stated in contract or subsequently agreed upon, and an estimated number of units.
c. Cost and percentage as described in general conditions.

7. A memorandum is attached showing the estimated cost breakdown of labor and materials by unit and quantities as prepared by the Contractor and checked by the Contract Compliance Specialist and Program Manager (if any).

8. The Maximum Allowed Cost for this Change Order is $ _____, and is established as Incumbrance Record No. _____ . This Maximum Allowed Cost may be amended by the Owner in the event the actual costs are expected to exceed the Maximum Allowed Cost, provided that Contractor shall give written notice of such fact prior to incurring actual costs in excess of ninety percent of the Maximum Allowable Cost. In no event shall actual costs be incurred in excess of the Maximum Allowed Cost, as it may be amended.

APPROVED AND AGREED BY CONTRACTOR:
LEGAL GC Firm Name

By: _____

_____
(Print Name/Title)

Date approved by Contractor: _____

RECOMMENDED FOR OWNER'S ACCEPTANCE
DESIGN PROFESSIONAL: Andrews Hammock & Powell, Inc.

By: _____

_____
(Print Name/Title)

Date approved by Design Professional: _____

APPROVED AND AGREED BY USING AGENCY:
GEORGIA COLLEGE & STATE UNIVERSITY

By: _____

_____
(Print Name/Title)

Date approved by Using Agency: _____

APPROVED AND AGREED BY OWNER:
BOARD OF REGENTS OF THE UNIVERSITY

By: _____

_____
(Print Name/Title)

Date approved by Owner: _____

FINAL COST AMENDMENT
TO
CHANGE ORDER NO. _____

1. A memorandum is attached showing cost breakdown of labor and materials by unit and quantities as prepared by the Contractor and checked by the Contract Compliance Specialist and Program Manager (if any).

2. We have verified the quantity and quality of all materials shown on the memorandum. We have verified that all prices are reasonable and do not exceed current costs for like services or materials, and we have verified that the quality of the materials meets the requirements of the Contract Documents.

3. The contractor shall be allowed _____ additional calendar days for completion. The Material Completion and Occupancy date is: _____ .

4. The Contract Sum shall be *(increased) (decreased)* by $ _____ on account of this change.

5. The payment and extension of time, if any, provided by this Change Order constitutes compensation in full to the Contractor and its Subcontractors, Suppliers, and Trade Contractors for all costs and markups, directly and indirectly attributable to the changes ordered herein, and for all delays or time related costs thereto and for any acceleration costs for performance of changes within the time stated and to be completed by the Material Completion and Occupancy Date and for any Claims related thereto against the Owner and the Design Professional, and design consultants.

APPROVED AND AGREED BY CONTRACTOR:
LEGAL GC Firm Name

By: _____

_____
(Print Name/Title)

Date approved by Contractor: _____

RECOMMENDED FOR OWNER'S ACCEPTANCE
DESIGN PROFESSIONAL: Andrews, Hammock & Powell, Inc.

By: _____

_____
(Print Name/Title)

Date approved by Design Professional: _____

APPROVED AND AGREED BY USING AGENCY:
GEORGIA COLLEGE & STATE UNIVERSITY

By: _____

_____
(Print Name/Title)

Date approved by Using Agency: _____

APPROVED AND AGREED BY OWNER:
BOARD OF REGENTS OF THE UNIVERSITY

By: _____

_____
(Print Name/Title)

Date approved by Owner: _____

APPLICATION FOR PAYMENT

APPLICATION FOR PAYMENT NO._____ PROJECT NO.

CERTIFICATE OF THE CONTRACTOR OR HIS DULY AUTHORIZED REPRESENTATIVE

To the best of my knowledge and belief, I certify that all items, units, quantities, and prices of work and material shown on this Application for Payment No. _____ are correct; that all work has been performed and materials supplied in full accordance with the terms and conditions of the Contract Documents between

(Owner)

and _____ dated

(Contractor)

and all authorized changes thereto; and that the following is a true and correct statement of the contract account up to and including the last day of the period covered by this Application and that no part of the "amount due this Application" has been received.

(a)	Total amount earned for work in place (original contract)	$
(b)	Total amount earned for work in place (Change Orders)	$
(c)	Value of materials stored at site	$
(d)	Total amount earned ((a) plus (b) plus (c))	$
(e)	Amount retained (10%)	$
(f)	Total earned less retained percentage ((d) minus (e))	$
(g)	Total previously approved	$
(h)	Amount due THIS ESTIMATE ((f) minus (g))	$
(i)	Retainage payment to Subcontractors per Paragraph 4 .1.2.5 of the General Conditions.	$
(j)	AMOUNT DUE Contractor ((h) minus (i))	$

I further certify that all claims outstanding against the undersigned Contractor for labor, materials, and expendable equipment employed in the performance of said contract have been paid in full in accordance with the requirements of said contract, except such outstanding claims as are listed below or on the attached sheet, which statement contains all claims against the Contractor which are not yet paid, including all disputed claims and any claims to which the Contractor has or will assert any defense.

I further certify that all of the materials indicated on this Application for Payment as being stored on the Site, but not yet incorporated into the building, have been purchased, delivered, and are now stored on the Site for future incorporation into the building and until so incorporated the title to same is, upon payment of this statement, vested in the Owner. Furthermore, the undersigned Contractor assumes full responsibility for the existence, protection, and, if necessary, replacement of the above-mentioned materials until the completion of this contract.

Contractor_____ By

Date _____ Title

STATEMENT OF THE CONTRACT COMPLIANCE SPECIALIST

I have checked this Application for Payment and, to the best of my knowledge and belief, the statement of work performed and statement of materials stored on site by the Contractor are supported by my observations

Name_____ Contract Compliance Specialist. Date:

CERTIFICATE OF THE DESIGN PROFESSIONAL

I certify that I have verified this Application for Payment and, to the best of my knowledge and belief, it is a true and correct statement of work performed and statement of materials stored on site by the Contractor and that the Contractor's certified statement of his account and the amount due him is correct and just. I further certify that all work has been performed and materials have been supplied in full accordance with the terms and conditions of the Contract Documents and authorized changes thereto.

Name_____ Design Professional. Date:

SCHEDULE OF CHANGE ORDERS

In support of Application for Payment No.

Project No._____ Period Ending:

Contractor:

CHANGE ORDERS		ADDITIONS			DEDUCTIONS
Number (1)	Date (2)	Authorized Amount (3)	Amount this Period (4)	Completed Previous Periods (5)	Authorized Deductions (6)

WORK PERFORMED TO DATE

In support of Application for Payment No.

For the period from _____, through _____ inclusive.

Project No.

Name and location of Project

Contractor's Name and Address

WORK INCLUDED IN ORIGINAL CONTRACT

DETAILED ESTIMATE				WORK PERFORMED TO DATE			
CSI Category and Description Item No. and Designation (1)	Number & Kind of Units (2)	Unit Price (3)	Estimated Cost (4)	No. of Units (5)	Amount Earned to Date (6)	Value of Incomplete Work (7)	Percent Complete (8)
A. Contracting Requirements: *							
a.							
b.							
c,							
1. Division 1 – General Requirements: *							
a.							
b.							
c.							
2. Division 2 – Site Construction: **							
(i) Building							
a.							
b.							
c.							
(ii) Infrastructure							
a.							
b.							
c.							
3. Division 3 – Concrete: *							
a.							
b.							
c.							
4. Division 4 – Masonry: **							
(i) Building							
a.							
b.							
c.							
(ii) Infrastructure							
a.							
b.							
c.							
5. Division 5 – Metals: *							
a.							
b.							
c.							

6. Division 6 – Wood and Plastics: *							
a.							
b.							
c.							
7. Division 7 – Thermal & Moisture: ***|							
a.							
b.							
c.							
Roof:							
8. Division 8 – Doors & Windows: *							
a.							
b.							
c.							
9. Division 9 – Finishes: *							
a.							
b.							
c.							
10. Division 10 – Specialties: *							
a.							
b.							
c.							
11. Division 11 – Equipment: ***							
(i) Fixed or Built-in:							
a.							
b.							
c.							
(ii) Moveable:							
a.							
b.							
c.							
12. Division 12 – Furnishings: ***							
(i) Fixed or Built-in:							
a.							
b.							
c.							
(ii) Moveable:							
a.							
b.							
c.							
13. Division 13 – Special Construction: *							
a.							
b.							
c.							
14. Division 14 – Conveying Systems: *							
a.							
b.							
c.							
15. Division 15 – Mechanical: ******							
(i) Building							
a.							
b.							
c.							
(ii) Infrastructure							
a.							
b.							
c.							
16. Division 16 – Electrical: **							
(i) Building							
a.							
b.							
c.							

(ii) Infrastructure a. b. c. 17. Division 17 – Special Inspections: ** (i) Building a. b. c. (ii) Infrastructure a. b. c. (iii) Documents							
A. Total Amount of original contract							
B. Plus or minus total previously approved C. O.'s Nos.---------- incl.							
C. Plus or minus C. O.'s Nos.----------incl. approved during period covered by this est.----------							
D. Total Net Adjusted Amt.							

NOTES: The following breakdowns must be accomplished in order to comply with Government Accounting requirements. Upon completion of the Project, the final Application for Payment must show all divisions and sections, and a Final Certification of Costs for Capital Asset Accounting completed and submitted with the Application for Final Payment.

*** Report Items in each division, by CSI division and such other breakdown as is useful to the Contractor or Contract Compliance Specialist.**

**** These items must be broken down into 2 categories, (i) Building and (ii) Infrastructure, reported by specification section. Infrastructure for these purposes is defined as everything outside a line five feet from the building footprint.**

***** These items must be broken down into 2 categories; (i) fixed equipment & furnishings and (ii) Moveable equipment & furnishings and reported by specification section.**

****** Division 15 – Mechanical. This item must be broken down into 2 categories, (i) Building and (ii) Infrastructure, reported by specification section. Chillers and HVAC units that serve the facility are to be included as a part of the Building, even if they are outside the 5-foot limit. Chillers and HVAC units that are outside the 5 foot limit and serve more than one facility, such as equipment used in a central plant, are to be included in Infrastructure.**

******* Division 7 – Thermal & Moisture Components of the Roof system should be reported as a separate line item. Generally, this includes components of Sections 7500 and 7600.**

SUMMARY OF MATERIALS STORED

In support Application for Payment No.

Project No._____ Period Ending:

Contractor:

ITEM NO.	NAME (Contractor or Subcontractor)	TYPE OF MATERIAL	QUANTITY	AMOUNT (Dollars)
		TOTALS		

Prepared by_____ for
(Contractor)

Date_____, and certified by him to be a true and accurate statement.

Checked:

By:
Contract Compliance Specialist

Date:

SUBCONTRACTOR RETAINAGE RELEASE CERTIFICATE
(To be Originated by Subcontractor)

TO: Board of Regents of the University System of Georgia, Owner
Georgia College & State University, Using Agency

RE: Project Name and Number: Heating Upgrade for Atkinson Hall, Georgia College & State University, Milledgeville, Georgia:
Certificate Regarding Subcontractor's Completed Work and Retainage Release

1. This is to certify that our work is one hundred percent complete for our subcontract number _____. Our retainage is due in accordance with the contract documents. Our scope of work included the _____. The total amount of retainage now due is $_____.

2. The Subcontractor hereby certifies that all work required under the above contract has been performed in accordance with the terms thereof, that all materialmen, subcontractors, mechanics, and laborers have been paid and satisfied in full, and that there are no outstanding claims of any character (including disputed claims or any claims to which the subcontractor has or will assert any defense) arising out of the performance of the contract which have not been paid and satisfied in full except as listed hereinbelow, which exceptions apply only to the release in Paragraph 5, below:

[Enter: "None" or List or Make Reference & Attach Exhibit A.]

3. The Subcontractor further certifies that to the best of his knowledge and belief there are no unsatisfied claims for damages resulting from injury or death to any employees, subcontractors, or the public at large arising out of the performance of the contract, or any suits or claims for any other damage of any kind, nature, or description which might constitute a claim or lien upon the property of the Owner.

4. The Subcontractor has received final payment in full settlement of all claims against the Owner arising under or by virtue the contract, and acceptance of such payment is acknowledged as a release of the Owner from any and all claims arising under or by virtue of the contract. This release includes any claims set forth or excepted in Paragraph 2 above.

5. [*Strike out if not applicable*] The Subcontractor has received final payment in full settlement of all claims against the Contractor arising under or by virtue the contract, and acceptance of such payment is acknowledged as a release of the Contractor from any and all claims arising under or by virtue of the contract except as set forth in Paragraph 2 above.

6. Payments pursuant to this certificate shall in no way diminish, change, alter or affect the rights of the Owner under the contract documents.

SUBCONTRACTOR:

By:_____ Date:

CONTRACTOR:

By:_____ Date:

DESIGN PROFESSIONAL:

By:_____ Date:

NOTICE: OWNER MUST RECEIVE A COPY WITH ALL ORIGINAL SIGNATURES.

FINAL CERTIFICATION OF COSTS FOR CAPITAL ASSET ACCOUNTING

Date: _____

To: _____ (Owner)

The following accounting of costs for Project No. _____ , Project Name: _____

_____ at _____

is submitted as follows, with the breakdown of costs as specified in the Final Pay Request attached hereto and incorporated herein, for the purposes of capital asset accounting pursuant to GASB 34 Accounting Statements:

1.	**BUILDING AND BUILDING IMPROVEMENTS: ***	**$** _____
2.	**INFRASTRUCTURE: ****	**$** _____
3.	**FURNISHINGS AND EQUIPMENT: *****	**$** _____
		==========
	TOTAL:	**$** _____

Notes: (Contractor must insure costs from all Change Orders are apportioned and included in each line item above)
* ***Building**:* Include totals from Items A, 1, 3, 5, 6, 7, 8, 9, 10, 13, 14, 15 and "Building" portions of Items 2, 4, and 16.
** ***Infrastructure**:* Include totals from the "Infrastructure" portions of Items 2, 4 and 16.
*** ***Furnishing and Equipment*** : Include totals from only the "moveable" portions of Items 11 and 12.

I certify to the best of my knowledge and belief that all of the amounts set forth on this Certificate are true and correct and are supported by the financial records for this project on file with the Contractor.

Contractor_____ By: _____

Date_____ Title: _____

CERTIFICATE OF THE DESIGN PROFESSIONAL

I certify to the best of my knowledge, information and belief that the amounts certified by the Contractor are consistent with the estimates provided in my final Statement of Probable Cost for the Project; that the Building Improvement contains a footprint based upon a line 5 feet outside the building structure) of _____ square feet, a total of _____ gross square feet, and contains _____ floors (including basements). The building fire protection system is _____ (include type of system). The Certificate of Occupancy was issued on _____. I further certify that the design intent for this project is that the Building and Building Improvements are of Building Construction Class _____ and ISO Occupancy Type(s) _____ and have an expected useful life of _____ years from the date of this Certificate, and that my observations of the construction confirm these expectations. (*See* Exhibit J of Design Professional Contract.)

Name_____Design Professional. Date: _____

CERTIFICATE OF THE USING AGENCY OR OWNER

I certify that to the best of my knowledge, information, and belief that the cost of the real property covered by this project, to the boundaries on the final Site Plan, was $ _____*and the cost of additional government-supplied furnishings and equipment acquired for this Project was $* _____
.

Name_____ Title: _____. Date: _____

SUPPLEMENTARY GENERAL CONDITIONS

None at time of Contract Execution.

SECTION F
Special Conditions

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F-01. OWNER

A. Wherever the term “Owner” appears in these specifications, it shall mean Georgia College & State University, Agent for the Board of Regents of the University System of Georgia, 270 Washington Street, S.W., Atlanta, Ga., 30334.

F-02. OWNERS REPRESENTATIVE ON CAMPUS

A. The Owners representative on campus is Mr. John Webb, Assistant Director of O&M - Plant Operations, Georgia College & State University, Milledgeville, Ga. or whomever said shall so designate for project.

F-03. ARCHITECT

A. Wherever the term “Architect” appears in the contract documents it is intended to identify the firm or individual responsible for the design and/or contract administration of the work called for in the contract documents. The work performed under this contract does not require the services of a registered architect; therefore, wherever the term “Architect” appears in the contract document it shall mean Mr. John Webb, Assistant Director of Plant Operations, Georgia College & State University, Milledgeville, Ga. or whomever said shall so designate for project.

F-04. BUILDING AND GROUNDS PROTECTION

The contractor shall confer with the Director of Plant Operations for Georgia College and State University for the location of any existing utilities. Damage to existing utilities or sidewalks will be repaired at the Contractor’s expense, if broken by wheeled equipment. Ruts in grassed areas shall be filled in and new grass replanted. Shrubs, walls, windows, and any permanent structure that is damaged by equipment or material shall be replaced or repaired to original condition before job is considered complete.

F-05. INSPECTION OF EXISTING FACILITIES PRIOR TO COMMENCING WORK

A. The contractor shall give notice in writing to the Architect, prior to commencing work for the purpose of arranging for a joint inspection by (a) the Architect, (b) the Contractor, (c) the Using Agency and (d) the authorized representative of the Owner, during the course of which inspection the three parties to the joint inspection shall prepare a schedule identifying and showing the location of any damage to the existing work which is ascertainable by inspection. The schedule shall be prepared in four counterpart originals each of which shall be

dated and signed on behalf of each party to the joint inspection. An executed and dated counterpart original shall be filed with: (a) the Architect, (b) the Contractor, (c) the Using Agency, and (d) Owner.

B. It is agreed that the preparation of the schedule is for the benefit of the Contractor and is intended to enable him to have the protection afforded by record of such existing damage as is visually ascertainable. The Contractor shall have no responsibility to repair any damage which shall appear on the above mentioned schedule nor shall he be responsible for repairing any existing damage which is not ascertainable by visual inspection or which was not a result of negligence on his part. Subsequently to the signing of the abovementioned schedule the Contractor shall be responsible for repairing any damage except as noted.

C. The Contractor shall perform a Pre-Construction walkthrough with the Owner to discuss interior finish colors.

F-06. SANITARY FACILITIES

Use only facilities designated by the Owner.

F-07. INDOOR AIR QUALITY

A. If the building or any portion of the building will be in use and occupied during construction, the Contractor shall schedule work and provide temporary ventilation and/or isolation to insure that fumes from welding, other construction tasks, and out-gassing from construction materials do not migrate to occupied areas.

F-08. UTILITIES

A. The Owner agrees to provide at no cost to the Contractor, electrical and water service utilities as they presently exist on the site for use during construction of this Project. The Contractor is required to protect Owner's utilities and equipment and to replace same if they become damaged or broken, at no cost to the Owner.

F-09. STORAGE

A. The Owner will designate specific areas for staging and storage of Contractor materials. Contractor shall coordinate exact location of storage area with Owner prior to bringing materials to the site. The area shall be left clean and restored to the same conditions as when accepted by the contractor at the completion of the job.

F-10. PARKING

A. The Contractor's employees will only be allowed to park in areas designated by the Owner. Any extra parking or storage space needed must be discussed with the Owner for designation of additional space.

F-11. TRASH DISPOSAL

A. The Contractor shall allow no trash to accumulate and shall remove same from the site at the close of each working day. All trash shall be disposed of off College property. The use of GC & SU waste facilities or containers is prohibited. Burning of any material on site is not permitted at any time.

F-12. ACCESS TO PREMISES

A. Ingress and egress shall be limited to the most direct access to the subject work areas. No vehicles or material shall be located even temporarily, so as to hinder normal college functions. Parking at the site is limited to areas as indicate by the Owner. Any debris dropped or tracked outside of immediate work area shall be cleaned up immediately. The buildings in which the work shall be accomplished will be occupied while work is in progress. Please follow all safety regulations to prevent injury or accident or student/personnel. Access to buildings or areas will be given by the Owner.

F-13. CONDUCT

A. During construction it is likely that your employees will come into contact with many members of the college community. It is expected that your employees and the employees of any sub-contractor employed by your firm will conduct themselves with a high degree of morality and conduct behavior. In the event of any inappropriate behavior, any individual may be required to leave College property and not be allowed to return to the job site. The decision of the College in this regard is final with no appeal on the part of the Contractor. There shall be no boisterous or obscene language and conversational noise among crew members shall be kept to a minimum.

F-14. DELIVERIES

A. The Contractor shall schedule deliveries to the job when a working crew is present. The Director Plant operations or his staff will not accept deliveries on behalf of the contractor.

F-15. HAZARDOUS MATERIALS

A. If the Contractor observes the existence of any hazardous or friable substance or material which must be disturbed during the course of his work, Contractor shall promptly notify Owner and Architect. Unless otherwise provided in these specifications, Owner shall make all arrangements regarding testing and removal or encapsulation of asbestos material if present. "Friable material" is any material which can be crumbled, pulverized or reduced to a powder by hand pressure when dry.

B. There has been a study of the site and any existing building to locate asbestos or other hazardous waste. A copy of the report may be viewed by contacting the Owner.

F-16. LAND FILL RECEIPTS

A. Contractor will provide to the Owner, land fill receipts or other appropriate disposal certificates for all material removed from GC&SU property.

F-17. SAFETY

A. The Contractor is expected to visit the job site to review the conditions under which his crew will work. Electrical hazards shall be noted. OSHA rules and Regulations shall apply.

B. The Contractor shall not allow any crew member to operate power equipment without proper training.

C. The Contractor shall designate a responsible member of the Contractor’s organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor’s Superintendent unless otherwise designated by the Contractor in writing to the Owner.

SECTION G - SCHEDULE OF DRAWINGS

T1	Title Sheet
ME1	Mechanical & Electrical Demolition Atkinson Mechanical Room
ME2	Mechanical & Electrical New Work Atkinson Mechanical Room
ME3	Mechanical Details
ME4	Mechanical Legend, Schedules & Piping Schematic

All drawings are dated June 25, 2013.

SECTION 01040 - PROJECT COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section: specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:

1. Coordination.
2. Administrative and supervisory personnel.
3. General installation provisions.
4. Cleaning and protection.

B. Progress meetings, coordination meetings and pre-installation conferences are included in Section "Project Meetings".

C. Requirements for the Contractor's Construction Schedule are included in Section "Submittals".

1.2 COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

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

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project Close-out activities.

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

1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work.

1.3 SUBMITTALS

A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

B. Show the interrelationship of components shown on separate Shop Drawings.

C. Indicate required installation sequences.

D. Comply with requirements contained in Section 15050 - Basic Mechanical Requirements.

E. Refer to Division-16 Section "Basic Electrical Requirements" for specific coordination drawing requirements for mechanical and electrical installations.

F. Staff Names: Within 15 days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require installer of each major component to inspect both the substrate and conditions under which work will be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

B. Manufacturer's Instructions: Comply with manufacturer's instructions and recommendations to extent these are more explicit or more stringent than requirements indicated contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing work. Secure Work true to line and level. Allow for expansion and building movement.

E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.

F. Recheck Measurements and dimensions of the work before starting each installation.

G. Install each component during weather conditions and project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

H. Coordinate temporary enclosure with required inspections and tests, to minimize necessity of uncovering completed construction for that purpose.

I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.2 CLEANING AND PROTECTION

A. During handling and installation clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Architect's Final Certificate.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Light.
11. Puncture.
12. Abrasion.
13. Heavy traffic.
14. Soiling, staining and corrosion.
15. Bacteria.
16. Rodent and insect infestation.
17. Combustion.
18. Electrical current.
19. High speed operation.
20. Improper lubrication.
21. Unusual wear or other misuse.
22. Contact between incompatible materials.
23. Destructive testing.
24. Misalignment.

25. Excessive weathering.
26. Unprotected storage.
27. Improper shipping or handling.
28. Theft.
29. Vandalism

END OF SECTION 01040

SECTION 01095 - DEFINITIONS, REFERENCE STANDARDS & ABBREVIATIONS

PART 1 - GENERAL

1.1 DEFINITIONS

A. General Explanation: A substantial amount of specification language constitutes definitions for terms found in other Contract Documents, including the drawings which must be recognized as diagrammatic in nature and not completely descriptive of requirements indicated thereon. Certain terms used in the Contract Documents are defined generally in this article. Definitions and explanations of this section are not necessarily either complete or exclusive, but are general for the work to extent not stated more explicitly in another provision of the Contract Documents.

B. General Requirements: The provisions or requirements of Division 1 sections. General Requirements apply to entire work of Contract and, where so indicated, to other elements of work which are included in the project.

C. Indicated: The term "Indicated" is a cross-reference to details, notes or schedules on the drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for purpose of helping reader located cross-reference, and no limitation of location is intended except as specifically noted.

D. Directed, Requested, etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by Architect, "requested by Architect," etc. However, no such implied meaning will be interpreted to extend Architect's responsibility into Contractor's area of construction supervision.

E. Approve: Where used in conjunction with Architect's response to submittals, request, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be held to limitations of Architect's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "approval" by Architect be interpreted as a release of Contractor from responsibilities to fulfill requirements of the Contract Documents.

F. Project Site: The space available to Contractor for performance of the work, either exclusively or in conjunction with others performing other work as part of the project. The extent of project site is shown on the drawings, and may or may not be identical with description of the land upon which project is to be built.

G. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.

H. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

I. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

J. Installer: The entity (person or firm) engaged by the Contractor or its subcontractor or sub-subcontractor for the performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in operations they are engaged to perform.

K. Testing Laboratory: An independent entity engaged to perform specific inspections or tests of the work, either at project site or elsewhere; and to report and (if required) interpret results of those inspections or test.

1.2 FORMAT AND SPECIFICATION EXPLANATIONS

A. Specification Production: None of these explanations will be interpreted to modify substance of requirements. Portions of these specifications have been produced by Architect's standard methods of editing master specifications, and may contain minor deviations from traditional writing formats. Such deviations are normal result of this production technique, and no other meaning will be implied or permitted.

B. Format Explanation: The format of principal portions of these specifications can be described as follows; although other portions may not fully comply and no particular significance will be attached to such compliance or non-compliance:

1. Sections and Divisions: For convenience, basic unit of specification text is a "section", each unit of which is named and numbered. These are organized into related families of sections, and various families of sections are organized into "divisions", which are recognized as the present industry-consensus on uniform organization and sequencing of specifications. The section title is not intended to limit meaning or content of section, nor to be fully descriptive of requirements specified therein, nor to be an integral part of text.

    a. Each section of specifications has been subdivided into 3 (or less) "parts" for uniformity and convenience (Part 1 - General, Part 2 - Products, and Part 3 - Execution). These do not limit the meaning of and are not an integral part of text which specified requirements.

C. Subordination of Text: Portions of specification text are subordinated to other portions in the following (traditional) manner (lowest level to highest):

1. Indented (from left margin) paragraphs and lines of text are subordinate to preceding text which is not indented, or which is indented by a lesser amount.
2. Paragraphs and lines of text are subordinate to sub-article titles, which are printed in upper/lower-case lettering.
3. Sub-articles are subordinate to article titles, which are printed in upper-case lettering.
4. Subordination (if any) of certain sections (or portions of sections) to other sections is described within those sections.

D. Underscoring: Used strictly to assist reader of specification text in scanning text for key words in content (for quick recall). No emphasis on or relative importance of text is intended where underscoring is used.

E. Imperative Language: Used generally in specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe responsibilities which must be fulfilled indirectly by Contractor, or when so noted, by others.

F. Section Numbering: Used to facilitate cross-references in Contract Documents. Sections are placed in Project Manual in numeric sequence; however, numbering sequence is not complete, and listing of sections at beginning of Project Manual must be consulted to determine numbers and names of specification sections in Contract Documents.

G. Page Numbering: Numbered independently for each section; recorded in listing of sections (Index or Table of Contents) in Project Manual. Section number is shown with page number at bottom of each page, to facilitate location of text in Project Manual.

H. Line Numbering: Provided on each page (either margin), strictly for purpose of facilitating subsequent references to specific text, for addenda, purchasing, subcontracting, modifications, change orders, and similar references.

I. Specification Content: Because of methods by which this project specification has been produced, certain general characteristics of content, and conventions in use of language are explained as follows:

1. Specifying Methods: The techniques or methods of specifying to record requirements varies throughout text, and may include "prescriptive", "open generic-descriptive", "compliance with standards", "performance", "proprietary", or a combination of these. The method used for specifying one unit of work has no bearing on requirements for another unit of work.

J. Overlapping and Conflicting Requirements: Where compliance with 2 or more industry standards or sets of requirements is specified, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, most stringent requirement (which is generally recognized to be also most costly) is intended and will be enforced, unless specifically detailed language written into the Contract Documents (not by way of reference to an industry standard) clearly indicates that a less stringent requirement is to be fulfilled. Refer apparently-equal-but different requirements, and uncertainties as to which level of quality is more stringent, to Architect for a decision before proceeding.

K. Contractor's Options: Except for overlapping or conflicting requirements, where more than one set of requirements are specified for a particular unit of work, option is intended to be Contractor's regardless of whether specifically indicated as such.

L. Minimum Quality/Quantity: In every instance, quality level or quantity shown or specified is intended as minimum for the work to be performed or provided. Except as otherwise specifically indicated, actual work may be either comply exactly with that minimum (within specified tolerances), or may exceed that minimum within reasonable limits. In complying with requirements, indicated numeric values are either minimums or maximums as noted or as appropriate for context of requirements. Refer instances of uncertainty to Architect for decision before proceeding.

M. Specialist; Assignments: In certain instances, specification text requires (or at least implies) that specific work be assigned to specialist or expert entities, who must be engaged for performance of those units of work. These must be recognized as special requirements over which Contractor has no choice or option. These assignments must not be confused with (and are not intended to interfere with) normal application of regulations, union jurisdictions and similar conventions. One purpose of such assignments is to establish which party or entity involved in a specific unit of work is recognized as "expert" for indicated construction processes or operations. Nevertheless, final responsibility for fulfillment of entire set of requirements remains with Contractor.

N. Trades: Except as otherwise indicated, the use of titles such as "carpentry" in specification text, implies neither that the work must be performed by an accredited or unionized tradesperson of corresponding generic name (such as "carpenter"), nor that specified requirements apply exclusively to work by tradesperson of that corresponding generic name.

O. Abbreviations: The language of specifications and other Contract Documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual word abbreviations of a self-explanatory nature have been included in texts. Specific abbreviations have been established, principally for lengthy technical terminology and primarily in conjunction with coordination of specification requirements with notations on drawings and in schedules. These are frequently defined in section at first instance of use. Trade association names and titles of general standards are frequently abbreviated. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of the Contract Documents so indicates. Refer to abbreviations at the end of this section.

1.3 DRAWING SYMBOLS

A. General: Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated. Where not otherwise noted, symbols are defined by "Architectural Graphic Standards," published by John Wiley & Sons, Inc., seventh edition. Graphic symbols used on mechanical/electrical drawings are generally aligned with symbols recommended by ASHRAE, supplemented by more specific symbols where appropriate as recommended by other recognized technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to Architect for clarification before proceeding.

1.4 INDUSTRY STANDARDS

A. General Applicability of Standards: Applicable standards of construction industry have same force and effect (and are made a part of Contract Documents by reference) as if copied indirectly into Contract Documents, or as if published copies were bound herewith.

1. Referenced standards (referenced directly in Contract Documents or by governing regulations) have precedence over non-referenced standards which are recognized in industry for applicability to work.
2. Non-referenced standards recognized in the construction industry are hereby defined, except as otherwise limited in Contract Documents, to have direct applicability to the work, and will be so enforced for performance of the work.

B. Publication Dates: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of date of Contract Documents.

C. Copies of Standards: Provide where needed for proper performance of the work: obtain directly from publication sources.

D. If the Contractor observes any acronyms or abbreviations in the Contract Documents of which he is not positively sure of their meaning, contact Architect for explanation **PRIOR TO BIDDING**.

1.5 GOVERNING REGULATIONS/AUTHORITIES

A. General: The procedure followed by Architect has been to contact governing authorities where necessary to obtain information needed for the purpose of preparing Contract Documents; recognizing that such information may or may not be of significance in relation to Contractor's responsibilities for performing the work. Contact governing authorities directly for necessary information and decisions having a bearing on performance of the work.

1.6 SUBMITTALS

A. Permits, Licenses and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgment, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01095

SECTION 02060 - DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 QUALITY ASSURANCE

A. Qualifications of Workmen: Provide at least one person who shall be present at all times during demolition operations and who shall be thoroughly familiar with the requirements of this portion of the work and the methods by which the same is accomplished.

B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with the requirements of those insurance carriers providing coverage for this work. During the period of the construction contract, all operations shall comply with the requirements of NFPA 241, Building Construction and Demolition Operations.

C. Contractor's Responsibility: It shall be the Contractor's responsibility to protect all existing construction designated to remain and to provide for the public safety during all demolition operations. All requirements of this specification apply only to the Contractor, unless specifically noted to apply to the Owner. Contractor shall transport all equipment indicated to be removed and all associated debris to an approved waste facility. Contractor shall pay all fees associated with the disposal of removed equipment and debris.

D. Damage to Existing Construction: In the event of damage to any construction and/or equipment not scheduled to be demolished or removed, the Contractor shall immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

E. Burning: On-site burning will not be permitted.

F. Asbestos: It is the Owner's responsibility to detach from the building and remove from the site all materials containing asbestos in areas where it is disturbed under this contract. Should the Contractor find that the Owner has not removed adequate amounts within the contract area or previously unknown asbestos containing materials, he shall cease work immediately in that area and notify the Owner. The Owner will make provision for its removal before the Contractor continues the work.

1.3 JOB CONDITIONS

A. Occupancy: Owner will be continuously occupying areas of the building immediately adjacent to areas of demolition. Conduct demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities which will severely impact Owner's normal operations. There are personnel in this building who require use of the elevator to access their offices. Contractor shall work over school break to make elevator “functional” before faculty returns.

B. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

1. Provide protective measures as required to provide free and safe passage of Owner's personnel, students, vendor's and general public around the work area.
2. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

C. Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks and other adjacent occupied or used facilities.

1. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

D. Utility Services: Maintain existing utilities indicated to remain, keep in service and protect against damage during demolition operations.

1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by Owner's representative. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

E. Environmental Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Barricades: Use only new and solid lumber and plywood of utility grade or better for the construction of all temporary barricades.

B. Miscellaneous: All other materials, not specifically described but required for the proper execution of the work of this section shall be selected by the contractor, subject to approval by the Architect.

PART 3 - EXECUTION

3.1 SCHEDULE

A. Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Owner's Representative for review prior to commencement of work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection.

B. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.

C. Coordinate with Owner's continuing occupation of portions of building.

3.2 INSPECTION:

A. Prior to commencement of demolition work, inspect areas in which work will be performed. Inventory existing conditions with Owner's Representative to verify condition of structure, surfaces, equipment or surrounding properties which could be misconstrued as damaged resulting from selective demolition work.

3.3 PREPARATION:

A. Locate, identify, stub off and disconnect utility services that are not indicated to remain. Provide by-pass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shut-down of service is necessary during change-over.

3.4 DEMOLITION:

A. Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with schedule and governing regulations.

1. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven impact tools.
2. Provide services for effective air and water pollution controls.

B. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written, accurate detail. Pending receipt of directive from Owner's Representative rearrange selective demolition schedule as necessary to continue overall job progress without delay.

3.5 DISPOSAL OF DEMOLISHED MATERIALS:

A. The contractor shall be responsible for removing all debris, rubbish and other materials resulting from his demolition operations from building site, including removal of materials resulting from new construction work, which shall be the Contractor's responsibility.

1. Burning of removed materials is not permitted on project site.

3.6 CLEAN-UP AND REPAIR:

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION 02060

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Manufacturers: All paints/stains selected for the coating and finishing system for each type of surface shall be the product of a single manufacturer and as described hereinafter.

1.2 DEFINITIONS:

A. Paint: Term used in a general sense and has reference to sealers, primer, stains, oils, alkyd, latex, epoxy and enamel type paints.

B. Painting: Term used in a general sense and has reference to the application of "paint" without regard to the type of material, to an item.

C. Back Prime: Terms used in a general sense and has reference to the application of "paint"(first coat) without regard to the type of material, to the back side(unexposed to view) of an item.

1.3 PRODUCT HANDLING:

A. Delivery: Deliver the products of this section in manufacturer's original unopened packaging with labels in tact and legible.

B. Storage and Protection: Store products of this section in a housed, dry and ventilated area, and protect from damage.

1.4 JOB CONDITIONS

A. Temperature: Maintain a constant temperature of not less than 65 degrees F during painting and drying operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers" Materials hereinafter described, unless specifically noted otherwise, are by the following manufacturers:

1. Devoe
2. Sherwin Williams
3. ICI
4. Porter Paints

B. Colors: Colors will be selected by the Engineer or Owner.

C. Accessory Equipment: Ladders, scaffolding, drop clothes, scrapers, dusters and similar items are not required to be new, but they shall be safe, adequate and acceptable of producing the results for which they are intended.

D. Application Equipment: Brushes, rollers, spray apparatus and similar application equipment are not required to be new, but they shall be capable of producing the required results specified hereinafter.

E. Thinners: Only those recommended for that purpose by the manufacturer of the material being installed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Surface Preparation:

1. General: Do not begin painting on any surface until it has been inspected and is in condition to receive the paint as specified herein. Should any surface be found unsuitable to produce a proper paint finish, the Engineer shall be notified in writing and no material shall be applied until the unsuitable surfaces have been made satisfactory. Absence of such notification shall be construed as acceptable of such surface to receive paint. Later claims of defects in surfaces prior to painting shall not relieve the Contractor from his responsibility for compliance with the requirements of the Specifications.
2. Steel and Iron: Remove grease, dirt, mud, rust and scale. Touch up any chipped or abraded places on items that have been shop coated. Where steel and iron have a heavy coating of scale, it shall be removed by de-scaling or wire brushing to produce a smooth surface for painting.
3. Masonry: Masonry surfaces to be painted shall be prepared by removing all dirt, dust, oil and grease stains, mortar droppings, and efflorescence.
4. Exposed pipes and conduit shall be cleaned using mechanical cleaning and/or solvents, mineral spirits or other paraffin-free solvents having a flash point no higher than 100 degrees F. and shall be painted in accordance with the Painting Systems Schedule.
5. Hardware, hardware accessories, lighting fixtures, switch and outlet plates, in place and not to be painted shall be removed prior to surface preparation and painting operations or protected. Following completion of painting of each space, removed items shall be reinstalled.

B. Application and Instructions:

1. The proportions of all ingredients in all paints and stains mixed on the site shall be in accordance with the recommendations of the paint manufacturer printed on the container applicable to the particular use for which the specific mixture is intended. No thinner or flattening oil will be used in the last coat. Screen out all lumps and impurities during mixing using clean containers, and protect against dirt or trash entering the mix. Stir until uniform consistency is procured.
2. During the actual application and drying of the paint, and until normal occupancy of the building occurs, a minimum temperature of 65 degrees F. shall be maintained. This temperature shall be held as constant as possible to prevent condensation.
3. Do not apply exterior paint in damp rainy weather or until the surface has dried thoroughly from the effects of such weather.
4. Surface to be stained or painted shall be clean, dry and smooth. Each coat of paint shall be smoothly applied, worked out evenly and allowed to dry before the subsequent coat is applied.

5. Enamel or varnish undercoats on wood surfaces and on steel surfaces shall be sanded smooth prior t recoating. Undercoats on steel and iron shall be dusted prior to recoating.
6. Finished work shall be uniform and of the specified color. It shall completely cover, be smooth and free from runs, sags, clogging or excessive flooding. Make edges of paint adjoining other materials or color, sharp and clean without overlapping. Where high gloss enamel is used, lightly sand undercoats to obtain a smooth finish coat.
7. Correction of improper or damaged work may be by "spot touching" except that in final coat corrections, a re-coating of the entire surface between corners or "breaks" will be required without additional charge.
8. Exposed piping, conduit, duct work and hangers in finished spaces, shall be painted a color as directed by the Engineer.
9. Cleaning: At completion of the work, clean all paint, coatings, oil and stain spots from all surfaces not required to be painted under this section. Remove all surplus materials and debris resulting from the work included herein.

C. Painting System Schedule: All trade names and numbers listed hereinafter are in the following order, unless specifically shown otherwise: Devoe/Sherwin Williams/ ICI/Porter.

1. Exterior: Including all existing painted surfaces unless specifically noted otherwise on drawings-See 3.1.1.8.)

a. Ferrous Metals (Not pre-painted)

1) 1 coat 13101/Kromik Primer/4160 Series.
2) 1 coat 70XX/B 54 Series/4308 Series Industrial Enamel

b. Galvanized Metals (except where specifically noted not to be painted)

1) 1 coat 13201/Galvite HS 4160
2) 2 coats 70XX/5-54/4308 Series Industrial Enamel

c. Pre-primed Metals (Mechanical equipment where noted on drawings to be painted)

1) 1 coat 11XX/Kem Kromik/Undercoat 4160 Primer
2) 2 coats 70XX/Industrial Enamel/4308 Series Industrial Enamel

END OF SECTION 09900

SECTION 15050

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 RELATED WORK

A. All Division 15 sections.

1.3 WORK SEQUENCE

A. Install mechanical piping, duct, controls, equipment and accessories as construction progresses so cutting and patching of new construction will not be required. See also paragraph "Sequencing and Scheduling" herein.

B. The existing building will be occupied during construction. The Contractor shall schedule work so as to minimize disruption to the normal operation of the facility in accordance with instructions and schedules provided by the Architect and/or Owner.

1.4 SUBMITTALS

A. Submittal data containing manufacturer's data shall be sent to the Architect, Engineer and Owner for review.

B. Electronic submittal data shall be assembled in Adobe Acrobat's Portable Data Format (PDF) for review.

C. Electronic submittal data shall be assembled in one (1) complete PDF file and shall include an index sheet (TOC) listing each submittal item by specification number and its content. Each file shall also be organized with "Bookmarks" of each section. Submittals that do not have each submittal item referenced by "Bookmarks" shall be rejected.

D. All electronic submittal data for a trade shall be submitted at one time except as noted herein.

E. Data not submitted shall have a statement explaining why the data was not submitted.

F. Submittals not conforming to any of the above requirements shall be rejected.

G. The contractor shall go to each specification section to determine all technical information/data required and organize information/data using tabs for major headings as follows:

H. HVAC Submittal Data

1. Section 15060 - Hangers and Supports

    a. Upper attachments
    b. Pipe attachment (hangers and clamps)
    c. Lower pipe supports
    d. Vibration isolators

2. Section 15075 - Mechanical Identification

    a. Pipe markers.

3. Section 15080 - Mechanical Insulation

    a. Insulation Product Information
    b. Jackets and Accessories Product Information
    c. Proof Of Insulation Contractor's Three Years Experience
    d. System sheet for each system identifying material, thickness and finish for each system.

4. Section 15110 - Valves

    a. Ball valves.
    b. Butterfly valves.
    c. Gate valves.
    d. Check valves.
    e. Extended neck option for ball valves on insulated piping.

5. Section 15122 - Meters and gauges

    a. Pressure gauges.
    b. Gauge Cocks.
    c. Stem type thermometers.
    d. Pete's (P & T) plugs.
    e. Steel venturis.
    f. Read out meter for Venturis.
    g. Read out meter for pressure compensating flow control valves.

6. Section 15181 - Hydronic Piping

    a. Single sheet indicating piping system and application and the pipe material intended to be used. Do not submit data sheets on piping.
    b. Automatic air vents
    c. High capacity automatic air vents
    d. Manual air vents
    e. Diaphragm type expansion tank
    f. Tangential type air separators
    g. Air purgers
    h. Strainers

i. Flexible pipe connectors
j. Backflow preventers
k. Water Pressure Reducing Valves
l. Tangential Particle Separators
m. Pressure compensating flow control valve
n. Pressure relief valves
o. Pre-insulated piping system
p. Steam pressure reducing valve.

7. Section 15185 - Hydronic Pumps

a. Base Mounted End Suction Centrifugal Pumps
b. Pump Specialty Fittings

1) Suction Diffusers
2) Triple Duty Valves

8. Section 15710 - Hydronic And Steam Heat Exchangers

a. Shell-and-Tube Heat Exchangers.

9. Section 15900 - HVAC Instrumentation and Controls

a. Control Product Data
b. Sequence of Control

10. Section 15950 - Testing, Adjusting, and Balancing

a. TAB Agent NEBB or AABC Certificate (Do not submit samples of TAB forms)

11. Letter from Contractor stating submittals have been checked and comply with the Contract Documents
12. Certification that all items are furnished under this contract are free of hazardous materials (e.g. asbestos, PCBs)

I. Manufacturer's data sheets shall be marked to clearly indicate the manufacturer, model number, size, color, accessories, required clearances, field connection details, weight loading, electrical characteristics, capacities, etc. being submitted. Submittals shall only include the products relevant to this specific project. Submittals shall not include other products produced by the manufacturer which are not specified on this project. Submittals containing several products on the same sheet shall have an arrow or other marker to identify the specific product submitted. Also, submittals for a single product that have options shall have an arrow or other marker to identify that the specified options are being provided. Submittals that include products not specified for this project, or that include several products on one sheet without being marked, or that do not show options selected shall be rejected. Variations from specifications shall be explained. Submittal preparer's name and telephone number shall be listed on the index sheet.

J. Piping Submittals: Submittal data required for piping systems shall consist of a single sheet of paper with the type of piping systems on this project, and the corresponding piping the contractor intends to provide. For example: “Cooling Water Piping Above Grade – Schedule 40 black steel”, “Cooling Water Piping Below Grade – Class 52 Ductile Iron.” Contractor shall not submit manufacture’s data sheets on piping.

K. Review, Corrections, or Comments made on the Submittals do not relieve the Contractor from compliance with the requirements of the Drawings, Specifications and Addenda (Contract Documents). By entering into this Contract, the Contractor agrees that the purpose of submittals is to demonstrate to the Engineer that the Contractor understands the design concept and that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and use. Review of shop drawing will be general only for basic conformance with the design concept. The review of such drawings, schedules or cuts shall not relieve the Contractor from the responsibility for correcting all errors of any sort contained in the submittals. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting proper fabrication processes, construction methods and installation techniques; coordinating this work with that of all other trades; and performing all work in a safe, workmanlike and satisfactory manner.

L. Below are the submittal item codes that will be used when reviewing the submittal data. These codes show up on the "Submittal Review" sheet. Only one copy of the submittal review sheet is returned upon completion of the review for each trade.

1. RNE - Reviewed, No Exceptions Noted

    a. Indicates the information provided has been reviewed and no exceptions are taken. Contractor must still comply with the contract documents.
    b. No corrective action required at this time.

2. FNC - Furnish with Noted Corrections

    a. Indicates the contractor shall insure that all necessary or noted corrections are incorporated into equipment furnished to the project.
    b. Contractor shall incorporate items requested in review comments, but re-submittal not required.

3. RES - Revise and Resubmit

    a. Indicates item is not presently acceptable as submitted, but may be accepted provided additional information and/or changes are made.
    b. Contractor shall revise and resubmit item to Engineer with additional information indicating compliance with Contract Documents prior to proceeding with work.

4. PSD - Provide Submittal Data

    a. Indicates submittal data was not provided for this item or section.
    b. Contractor shall provide submittal data meeting the explicit requirements of the plans, specifications, and all addenda.

M. Shop drawings and data submittals for materials requiring extra long delivery time shall be submitted for approval as soon as possible after execution of contract. All items shall be submitted for approval in a timely manner (prior to other submittals if necessary) so they may be properly incorporated in the building's structure. Allow a minimum of three weeks for review. No substitutions of materials or extensions of contract time will be allowed for Contractors failure to submit or order such materials sufficiently in advance of the work.

1.5 REGULATORY REQUIREMENTS

A. All work installed under Division 15 shall conform to the current adopted Edition of Building/Mechanical Codes and their appropriate amendments:

1. Life Safety Code, NFPA 101
2. International Building Code with Georgia Amendments
3. International Mechanical Code with Georgia Amendments
4. Standard for the Installation of Air Conditioning and Ventilating Systems, NFPA 90A
5. International Plumbing Code with Georgia Amendments
6. International Gas Code with Georgia Amendments
7. National Fuel Gas Code, NFPA-54
8. City of Milledgeville and Baldwin County Codes
9. Requirements of the State of Georgia Fire Marshall's Office.
10. GA State Minimum Standard Energy Code.

B. Materials and Equipment included in Underwriter's Label Service shall bear that label. Electrical equipment shall be UL approved as installed, and bear the UL label, unless noted otherwise herein. All fans shall be AMCA certified and bear that label for performance and sound. All air conditioning equipment shall be ARI certified and bear that label.

C. Where requirements of these specifications differ from specified codes and ordinances, conform to the more stringent requirements.

1.6 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions. Shift or relocate equipment or systems to avoid conflicts with other trades. Modifications to the work required to accommodate project conditions encountered in the field shall be made at no additional cost to the contract.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

C. Install items so that there are no obstructions (e.g., pipes, conduits, etc.) blocking service panels of the equipment, or preventing the removal of the equipment.

1.7 SEQUENCING AND SCHEDULING

A. Contractor shall coordinate work so as to avoid conflicts with other work in progress.

B. Work shall progress in a manner that will not interfere with other trades. The Division 15 Contractor shall have coordination meetings with all other Contractors to insure that all systems installed in "share areas" (e.g. ceiling plenums, mechanical rooms, etc.) are coordinated and installed to insure proper fit and access. All costs required for the coordination of the work between trades shall be borne solely by the Contractor.

C. Contractor shall provide confirmation letters from the factory (not from the contractor) to the Owner that long lead items have been ordered. Long lead items are defined as items having longer than six week fabrication schedules. See Section 01100 - Summary for additional requirements.

D. Phasing: Contractor shall conform to phasing plans as stated in the Architectural contract documents.

1.8 ACCEPTABLE PRODUCTS

A. Basis of Design: Model numbers indicated herein or shown on the drawings are the Basis of Design and are based on the most recent literature provided to the Engineer from the Manufacturer's Representative. The Contractor may substitute equal and approved equipment from the basis of design manufacturer or manufacturers listed in this specification (or set forth in an addendum) provided said equipment has all features which are inherent with the "Basis of Design" equipment, meets all requirements of the plans and specifications, has like electrical characteristics (e.g., same voltage, phase, ampacity/fusing/circuit breaker requirements, single or multiple points of connection as indicated on the electrical drawings), and will properly fit in the available spaces in the building. If the Contractor chooses to provide equipment which meets all of the aforementioned requirements, but has different characteristics, from that shown on the Contract Electrical Drawings, he shall bear all costs associated with that substitution. Electrical costs include, but are not limited to materials (breakers, fuses, disconnects, wiring, conduits, panels, starters, contactors, and the like) installation costs and re-engineering. All electrical connections shall be coordinated with the Engineer and with the electrical subcontractor. Other costs may include, but are not limited to, additional structural support for heavier equipment than basis of design.

B. Prior Approval: Substitutions of specified items will be considered only if written request has been submitted for review at least ten days prior to the receipt of bid proposals. Each request shall include a description of the proposed substitute, the specification page and line number where it is referenced, the name of material or equipment for which it is to be substituted, drawings, cuts, performance and test data for an evaluation and a statement from the equipment manufacturer's representative that the items to be substituted meet or exceed the specification of the item substituted for.

C. Addenda: If the substitution is allowed, such approval will be set forth in an Addendum.

D. Costs: All costs incurred by the acceptance of substitutions shall be borne by the contractor.

E. Acceptable Products: Where a manufacturer has been listed as being acceptable in the various specification sections (or addenda) hereinafter for a certain product, it shall be understood that the manufacturer has been approved as being capable of producing this product. This does not necessarily constitute approval of their standard product. The manufacturer's product shall still comply with all of the requirements and standards of this specification and not necessarily their standard specification, to the extent that it might require special custom manufacture to meet the requirements and standards of this specification, the requirements of the drawings and the inherent features of the "Basis of Design". Submitted products, not complying with the explicit requirement of these specifications and drawings and with the features of the "Basis of Design" will be rejected even if their manufacturer is listed in the specifications.

1.9 DRAWINGS

A. General: Both the drawings and specifications shall be considered supplemental to one another so that materials and labor required by one but not the other shall be supplied and installed as though specifically called for by both. Where drawings and specification conflict, Contractor shall conform to the more stringent or costly of the two requirements.

B. Scaling: The drawings are diagrammatic only and show generally the location of the equipment, ducts and pipes but are not to be scaled. All dimensions shall be verified at the building site. Prefabrication of work from the drawings shall be at the Contractor's risk.

C. Existing Conditions: It shall be the Contractor's responsibility to visit the site prior to bidding the project and prior to beginning work to make himself familiar with existing conditions.

1.10 SPACE CONDITIONS AND SERVICE CLEARANCE

A. All equipment and materials shall fit into the available spaces in the building and must be introduced into the building so as not to cause damage to the structure. All equipment normally requiring service shall be made readily accessible by not locating it above (behind, etc.) piping, ductwork, conduit or other systems. Contractor shall also provide access by means of access panels, doors, etc. to be provided under this section of specifications where required or specified. Provide sufficient space to allow service (e.g. filter removal) of all new and existing equipment. Coordinate with all trades to insure accessibility and service of all equipment. Equipment located above lift out ceilings shall be considered to be accessible. Equipment located above hard (unremovable) ceilings shall be considered to be unaccessible and access panels shall be provided as specified herein.

B. The contractor shall be responsible for verifying that the particular manufacturer's equipment that he chooses will fit in the available space, and shall verify (prior to submitting equipment) that the service clearances that the manufacturer requires are available, and shall not submit equipment that will not allow the manufacturer's service clearances. During construction, the contractor shall install the equipment such that the manufacturer's service clearances are provided by reading the installation instructions. The contractors shall bear all costs associated with providing equipment that requires service clearances different from the basis of design equipment. If the manufacturer's service clearances are not provided, the contractor shall remove the equipment and provide

equipment with service clearances equal to the basis of design equipment. The contractor shall submit a detailed sketch and description of any modifications to install the particular manufacturer's equipment that he chooses, to demonstrate that the equipment will fit and have the manufacturer's service clearances. The sketch is not submitted for review or approval or for confirmation that it is correct, only to certify that the contractor has completely considered the installation of substitute equipment.

1.11 MOISTURE INTEGRITY

A. Wall: All wall penetrations shall be sealed and caulked watertight.

1.12 NOISE AND VIBRATION

A. When in operation, all systems included in this section of specifications shall be free from objectionable or abnormal noise and vibration. See Section 15060 of the specifications for specific vibration isolation requirements.

1.13 PROTECTION OF MATERIALS AND EQUIPMENT

A. Delivery, Storage and Handling: Deliver products to site in factory-fabricated protective containers, with (where appropriate) factory-installed shipping skids and lifting lugs. Store in clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

B. Maintenance of Strainers: The Contractor shall be responsible for maintaining all liquid strainers until Architect's Final Certificate. No air system shall be operated at any time without air filters and filters shall not be allowed to become overloaded with dust and dirt. For throwaway filters, new clean filters shall be installed. Strainer media shall be cleaned.

C. During Construction: Pipe openings shall be closed with caps or plugs. All open duct shall be sealed tight with polyethylene. All equipment and material shall be stored in accordance with manufacturer's recommendations. No equipment, ductwork, piping, or materials shall be stored inside or outside the building unless it is properly protected from the weather. The Engineer reserves the right to reject any items furnished under Division 15 which have been damaged or are not in "like-new" condition. Existing facilities shall be protected. Any existing items damaged during construction shall be replaced or restored to their original condition by the Contractor, at no cost to the contract.

D. Suspended Ductwork, Suspended Equipment and Suspended Piping: Installation of suspended HVAC ductwork in areas where the roof is not "dried in" is only acceptable if the Contractor coats each joint of the supply, return, outdoor air and exhaust duct with duct sealant as specified. Contractor is also required to wrap suspended ductwork, equipment and piping on three sides with a minimum 4 mil thickness polyethylene taped to the bottom of the ductwork, equipment and piping. Polyethylene covering is required to protect from the weather, water, dirt, roof tar, concrete, etc.

E. Non-Suspended Ductwork, Equipment and Piping: Contractor is required to wrap mechanical equipment, ductwork and piping that is not suspended with two layers of 4 mil polyethylene.

F. Prior to Final Construction Review: All materials and equipment shall be cleaned. Chipped or scraped paint shall be retouched to match. All dents and sags in ductwork and equipment casings shall be straightened or replaced.

G. Equipment Painting: Equipment which has been damaged beyond the point of retouching or has been retouched not to match the original finish shall be repainted in accordance with the Architectural painting section.

1.14 ELECTRICAL

A. General: Motors, controls, relays and switches required for proper operation of equipment covered under this section shall be furnished and installed under this division of the specifications.

B. Wiring: All control and interlock wiring shall be furnished and installed under Divisions 15 - Mechanical. Power wiring through the disconnect and starter and to the motor shall be furnished and installed under Electrical Section. All control wiring and conduit shall conform to the material and installation requirements of Division 16.

C. Electrical Connections: Voltage, phase, ampacity and connection arrangement (e.g. single or multiple point) of each item of electrically driven equipment provided under this section of specifications shall conform to that shown on the Electrical drawings. Two speed motor winding arrangement shall match the starter type specified by Division 16.

D. Electrical Characteristics: The horsepowers, voltages and phases shown on the drawings and specified herein, are the estimated power requirements of all equipment furnished herein and is the basis of the design shown on the electrical drawings. If the Contractor provides equipment from the "Basis of Design" manufacturer or from other approved manufacturers with larger horsepowers, different voltages, different phases or ampacity, he shall coordinate with other trades to provide any additional wiring, circuitry, starters, breakers, transformers, etc., as required at no additional cost to the Contract.

1.15 MOTORS

A. General: This paragraph is applicable to all Division 15 specification sections. Motors less than 250 watts and used for intermittent service may be manufacturer's standard.

B. Motor Enclosures: Motor enclosure shall be appropriate for the environment that the motor will be in. In the absence of specifically identified motor enclosure style, the following requirements shall apply. Motors located in exterior locations, wet air streams, etc. shall be totally enclosed fan cooled (TEFC). Motors located in interior locations, in mechanical rooms, in dry air streams, etc. shall be open drip proof (ODP).

C. Motors Efficiency: Each motor 1 hp and above shall have a guaranteed minimum efficiency complying with the Energy Independence and Security Act of 2007 (EISA), and as specified below, and a minimum power factor of 82.5. Multi-speed motors do not have to comply with these efficiencies. Each motor's NEMA nominal efficiency shall be shown on the motor nameplate. Efficiency and losses shall be determined in accordance with the latest revision of IEEE Standard 112, Method B, using "Accuracy improvement by segregated loss determination including stray load loss measurement." Motors shall meet

the minimum NEMA premium motor efficiency, as outline in MG1 Table 12-12, which is higher than the EPACT efficiency. Each submittal shall show that motor meets this guaranteed minimum efficiency, and that efficiency was measured according to this specification. Minimum efficiencies for 4-pole 1750 rpm motors are listed below:

1. Motor HP 1: Minimum Premium Efficiency: 85.5
2. Motor HP 1.5 to 2: Minimum Premium Efficiency: 86.5
3. Motor HP 3 to 5: Minimum Premium Efficiency: 89.5

D. Motor Service Factor: Motor service factor for all equipment 1/8 hp and above shall be 1.15 for ODP motors and 1.0 for totally enclosed motors.

E. Motor Speed: Maximum 1800 rpm. Single phase, ODP motors shall be equipped with speed controllers as specified on plans.

F. Motor Thermal Overload Protection: All single phase motors shall be provided with integral overload protection. Internal protection shall automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

G. Bearings (Single Phase Motors): Ball type for belt-connected motors and other motors with high radial forces on motor shaft; sealed, pre-lubricated-sleeve type for other single-phase motors.

H. Bearings (Three Phase Motors): Double-shielded, pre-lubricated ball bearings suitable for radial and thrust loading.

I. Motor Nameplate: Provide on all motors 1/4 hp and above a permanent visible engraved nameplate indicating horsepower, RPM, voltage, phase, amps, cycles, full load amps, locked rotor amps, frame size, service factor, power factor and efficiency.

J. Motor Type: All single phase motors shall be provided with motor type suitable for starting and operating torque. Shaded pole motors shall be allowed on 1/20 hp or less motors only. Split-phase, capacitor start, permanent split capacitor and capacitor start/capacitor run shall be provided on all single phase motors above 1/20 hp based on specific torque requirements.

K. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.

L. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor. Whenever starting requirements exceed operating requirements, the motor shall be large enough to start the equipment without overheating. As a minimum, motors shall be sized at 120% of design BHP requirements. Each motor shall be sized to drive the equipment taking into account belt losses.

M. Motors controlled by Variable Frequency Drives: All motors that are controlled by a variable frequency drive shall be either premium efficiency type or inverter duty rated. Motor windings shall be insulated with Class F insulation or Class H insulation. General high efficiency motors and motors with Class B insulation shall not be allowed. Motor manufacturer shall certify in writing with motor submittal that motor is compatible with variable frequency drive usage.

1.16 PAINTING

A. All bare steel piping, pipe hangers, supports and miscellaneous metal exposed to view provided under this section of specifications, shall be cleaned and painted under the Architectural painting section of the specifications. Supports, hangers and accessories exposed to view shall not be electroplated, in order to allow them to be painted. All bare steel piping, pipe hangers, supports and miscellaneous metal in the mechanical room(s) shall be cleaned and painted under the Architectural Painting Section of the specifications. In the event that there is no Architectural painting section, painting shall be done under this division of the specifications in accordance with the requirement of ANSI A13.1.81.

1.17 CLEANING

A. The Contractor shall maintain the site reasonably clean and free of excessive debris and leftover materials at all times. All trash and debris shall be hauled from the job site on a daily basis for disposal. Prior to testing and adjusting, equipment shall be clean and free of any construction debris and litter.

B. Contractor shall meet all contractual requirements as related to site cleanliness including dust control.

1.18 HAZARDOUS MATERIAL ALERT FOR NEW MATERIALS

A. Contract Materials which are scheduled to be incorporated into the work under this Contract shall first either be certified by the Manufacturer to be free of hazardous materials or be inspected and tested by accredited laboratories and certified to be free of hazardous material content (e.g. Asbestos, PCBs, lead, etc.) in accordance with OSHA, EPA and AHERA Rules (and 1982 School Rules).

1.19 GENERAL DEMOLITION

A. General: Demolition shall include the wrecking and removal of certain mechanical components. See drawings for extent of demolition.

B. Disposal: All equipment shall be carefully removed during demolition and stored in location as directed by Owner. Contractor shall then contact Owner prior to disposal of any and all mechanical equipment removed during demolition work, Owner shall retain any such equipment at his discretion and Contractor shall store retained equipment on site as directed by Owner. Equipment not retained shall become property of the Contractor and shall be lawfully removed from site. Some specific equipment (e.g.,) has been

specifically noted to be retained by the Owner. Equipment shall become property of the contractor and shall be lawfully removed from site. With regards to the salvage value of property that is to be demolished, Owner shall not be responsible for condition of or loss of, or damage to such property after award of contract.

C. Existing work to remain shall be protected by temporary covers, supports, etc. during demolition work. Should any item that is to remain be damaged during demolition work, it shall be repaired to its original condition or replaced with new.

D. Some existing equipment, piping and ductwork may be shown to remain for reuse. The contractor is not responsible for the condition of or proper operation of any existing equipment, piping, or ductwork that is being reused. (See above paragraph for exception when contractor damages item that is to remain.) For example, if air conditioning unit is being reused, and unit does not operate properly, contractor is not responsible for unit operation. Some existing to remain for reuse equipment may be specified with a baseline TAB or functional test to verify proper operation. Contractor is not responsible for correcting any deficiencies revealed by the testing.

E. Provide weather protection for all interior portions of the building during demolition work. Where existing wall mounted or roof top or other equipment is being removed and expose the building to the elements, have materials and workmen ready to install adequate temporary covering of the exposed area.

1.20 ASBESTOS ALERT FOR EXISTING CONSTRUCTION

A. General: The Owner has indicated that all known asbestos containing materials (ACMs) have been removed from this facility; however, some ACMs may remain. Accordingly, the Contractor shall use caution during all demolition procedures. It shall be the Contractor's responsibility to see that all his personnel and that all of his subcontractors personnel are made aware during demolition, or any similar work, or in the process of connecting to or working adjacent to existing equipment or materials, that at any time any workman encounters any suspect asbestos containing materials (ACMs), all work in that area shall be stopped immediately and the suspect spaces kept cleared until a testing and/or abatement by a properly qualified firm, selected by the Owner, has been accomplished. In the event the suspect material proves to be asbestos, all affected areas shall be kept isolated until all such asbestos material has been removed and the spaces affected duly approved for normal use. <u>It is to be noted that only Owner authorized and approved personnel shall be allowed to participate in any manner whatsoever either in the search of or the removal of asbestos suspect material. See also the notes on the drawings.</u>

B. Asbestos Containing Materials to Remain: The Owner may elect <u>not</u> to remove ACMs which are <u>not</u> anticipated to conflict with new work or demolition required in this contract and will, therefore, remain undisturbed. If during demolition or new work procedures the Contractor determines that he must disturb any suspect ACM (that the Owner intended to leave undisturbed), he shall stop work until the Owner's Abatement Firm can properly remove the Asbestos.

1.21 STRUCTURAL COORDINATION

A. The party responsible for the installation of the system furnished under Division 15 shall provide the General Contractor with the weight of all mechanical equipment and ductwork and piping and the exact location. General Contractor shall then insure all structural members are properly sized and all mechanical penetrations are properly framed to support the full perimeter of the equipment. See also paragraph "Acceptable Products".

1.22 TEMPORARY HVAC PROVISIONS

A. The Owner is occupying the building during construction, and the Contactor shall maintain the heating, ventilating and air conditioning systems at all times in areas that the Contractor is not working in, whether occupied or not. Contractor shall provide temporary heating in areas he is working in for freeze protection, and shall maintain a minimum 60°F temperature inside. Contractor is not required to provide temporary air conditioning in areas he is working in. Since this project involves the replacement of the central WSHP heating and cooling plant, Contractor shall not perform demolition work on the entire central plant at one time unless means are provided to supply loop water flow and temperatures equal to the central plant capacity. Contractor shall stagger pump demolition to maintain one loop and cooling water pump, and coordinate equipment demolition and new work installation with the Owner to meet the Owner’s schedule. No equipment may be removed until new replacement equipment is on site. Temporary cooling and dehumidification and heating systems shall be provided by the Contractor in all areas outside the Contractor’s work area if Contractor’s work affects these other areas. Contractor shall submit proposed methods and equipment for temporary systems, and shall submit to Owner for approval. Contractor shall maintain maximum 80°F dry bulb and 50% relative humidity for air conditioning and dehumidification requirements, and 70°F for heating requirements for areas occupied by the Owner.

1.23 ROOM NUMBERS

A. The room numbers indicated on the Contract Documents were provided by the Architect to assist in identifying spaces during construction. These room numbers may not necessarily be the Owner's final choice of room numbers. The contractor shall obtain from the Owner the final choice of room numbers, and shall use these numbers wherever required. (For example, room numbers are used in programming of control systems, and shall match the Owner's final choice.)

1.24 CONTRACTOR REQUESTS FOR ELECTRONIC COPIES OF CAD DRAWINGS

A. If the Contractor requests to obtain electronic copies (emailed files or disc files) of CAD drawings from Andrews, Hammock & Powell, Inc., (AH&P) this paragraph shall describe the conditions for this action to take place.

1. The Contractor must obtain written permission from the Architectural client, that the Architect does not object to providing electronic copies when AH&P is hired by an Architect to perform Engineering services.
2. If AH&P is prime party (i.e. not hired by an Architect, but hired by the client directly), Contractor must obtain permission of AH&P to obtain electronic copies.

3. If approval by Architect or Engineer (as noted above) is obtained, Contractor may obtain electronic copies based on the following rates: $25 per sheet, with minimum $200 per project.
4. Contractor shall mail a copy of the check to AH&P, payable to AH&P and shall sign the enclosed indemnification letter, and send this letter to AH&P, along with requested sheets. If time is of essence, a copy of the check and indemnification may be faxed as evidence of the Contractor's intent to mail said documents.
5. Upon receiving the check or faxed copy, and signed indemnification letter, electronic copies of requested sheets shall be provided. AH&P reserves the right to alter the electronic copies by removing Professional Engineering Stamp, title block information, company logo, and similar information that is not relevant to the Contractor's needs. Contractor shall indicate the desired format for CAD drawings (DWG or DGN).

END OF SECTION 15050

Andrews, Hammock and Powell, Inc.
250 Charter Lane
Macon, GA 31210

Re: Letter of Indemnification

_____
(Project Name)

Gentlemen:

By hereby executing this Letter of Indemnification on behalf of itself and its subcontractors and suppliers, _____(company name) agrees to hold harmless and indemnify Andrews, Hammock and Powell, Inc. and the project architect and the consultants from and against all claims, liabilities, losses, damages and costs including but not limited to attorney's fees, arising out of or in any way connected with the use of, modification of, misinterpretation of, misuse of, or reuse by others of computer aided design (CAD) information and data provided on the above referenced project. The foregoing information applies, without limitation, to any use of the project information on this project, other projects, for additions to this project, or for any changes to this project by others.

_____ (company name) also acknowledges that the drawings prepared by Andrews, Hammock and Powell, Inc. is schematic in nature and is not intended as a shop drawing, dimensional drawing or fabrication drawing. Any dimensional information extracted from the CAD data by

_____(company name) is done purely at their own risk.
_____ (company name) agrees to insure that any use of the above referenced CAD information without the expressed written authorization for any other projects other than referenced project is hereby prohibited.

Signing on behalf of_____(company name),

_____
Signature

_____
Print Name

_____
Date

SECTION 15051

MECHANICAL CLOSEOUT DOCUMENT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Mechanical Closeout Document Requirements which are specifically applicable to all Division 15 Sections, in addition to the requirements of Division 1 - General Requirements.

B. Individual Plumbing, Fire Protection, and HVAC Closeout document requirements.

C. Record Document Submittals "As-Builts".

D. Contractor Guarantee.

E. Manufacturer Warranties.

F. Operating Instructions and Training.

G. Operation and Maintenance (O&M) Manuals.

H. Maintenance and Service.

I. Completion of Work.

J. Service Contracts

K. Manufacturer's Field Services and Start-up by Factory Authorized Personnel

L. O&M Instruction Form.

M. Spare Parts.

1.3 RELATED WORK

A. All Division 15 sections.

1.4 RECORD DOCUMENT SUBMITTALS “AS-BUILTS”

A. The contractor shall be required to maintain a clean, undamaged set of blue or black line white prints of contract drawings and shop drawings.

B. The mechanical contractors (plumbing, HVAC and Fire Protection) shall mark the set to show the actual installation where the installation varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
2. Mark new information that is important but was not shown on Contract Drawings or Shop Drawings.
3. Note related Change Order numbers where applicable.
4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
5. "As-builts" shall be submitted to the architect/engineer for review of the mechanical, plumbing and fire protection as installed upon completion of the work. Changes on "as-builts" are to be shown using standard engineering drafting practices. Freehand drawn changes will not be accepted.

1.5 CONTRACTOR GUARANTEE

A. All equipment and materials furnished (and/or installed under this section) and all work performed under this section of specifications, shall be guaranteed to be free of defective materials and workmanship for a period of one year (unless a longer period is specified elsewhere) after date of substantial completion. Upon notice of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be promptly replaced with new parts by the Contractor at no additional cost to the Owner. All labor required to perform guarantee shall be included as part of the complete guarantee warranty.

1.6 MANUFACTURER'S WARRANTIES

A. Provide as a minimum a one (1) year manufacturer's equipment warranty against defective components for each piece of equipment and its components installed under their respective specification section prior to final inspection in accordance with each of the trades listed below. Equipment warranties shall commence on the date of Substantial Completion as established in the Certificate of Substantial Completion issued by the Architect. Contractor shall note that there may be more than one certificate of Substantial Completion and date of Substantial Completion for this contract. Any parts which fail during the first year shall be replaced by the Contractor at no additional cost to the Owner.

B. HVAC: Each piece of equipment and its components furnished shall carry a minimum one (1) year warranty for replacement of parts and the labor required to complete such warranty work.

1.7 OPERATING INSTRUCTIONS AND TRAINING

A. Instructions: Instruct operating personnel as required (but a minimum of 16 hours) in operation and maintenance of all systems included in this Division (15) of the specifications. In addition, there shall be the quantity of dedicated instruction for certain specific pieces of equipment as specified in the individual specification sections herein. Provide signed O & M Instruction Verification Form as specified in later paragraph certifying instructions have been received.

B. Training: See each specification section for specific training requirements.

1.8 OPERATING AND MAINTENANCE (O&M) MANUALS

A. Operating and maintenance manuals shall comply with Division 1 Section “Operation and Maintenance Data.

B. Three bound and indexed Operating and Maintenance Manuals shall be prepared by the Contractor and be submitted for approval prior to delivery to operating personnel. Binders shall be 3-ring commercial grade, complete with inside storage pockets, sheet protectors, spine and front cover labels.

C. Each Manual shall contain the following information, data and drawings:

1. HVAC

a. List of Contents. Insert under clear front cover of binder.
b. Contractors one (1) year guarantee.
c. Manufacturer's equipment warranties (provide a warranty for each piece of equipment).
d. Copy of O & M Instruction Form showing Contractor has instructed designated personnel in the proper operation of all Division 15 systems.
e. Installation, operating and maintenance instructions for each item of equipment. Provide trouble shooting checklist guide.
f. Manufacturer's list of renewal parts for each item of equipment with recommended stock items and quantities indicated.
g. Copy of approved submittals, shop drawings showing layouts and construction details.
h. Copy of inspection report by Georgia Department of Labor for inspection of boilers.

1.9 COMPLETION OF WORK

A. At the completion, an on-site construction review shall be made and the entire system shall be shown to be in specified working condition. Contractor shall also have all cleanout plugs removed from wall cleanouts, floor cleanouts and outside cleanouts and placed on the ground adjacent to cleanout for inspection. The following shall be available during the inspection:

1. Contractor representative

2. Mechanic with hand tools
3. Test and Balance Report
4. Complete specifications and drawings with all addenda and revisions.
5. Control person who can demonstrate the complete sequence of control.

1.10 MAINTENANCE AND SERVICE

A. Maintenance: The Contractor shall provide any necessary services for all systems installed under these contract specifications for one year from date of substantial completion.

B. Parts and Labor: Provide repair parts and all labor during maintenance periods.

1.11 EXTENDED SERVICE CONTRACTS

A. Refer to each specification section to determine if an extended (beyond 1 year) service contract is to be provided for the piece of equipment listed in the specifications.

1.12 MANUFACTURER'S FIELD SERVICES AND START-UP BY FACTORY AUTHORIZED PERSONNEL

A. Refer to each specification section for additional requirements the manufacturer shall provide under the provisions of this specification.

B. Upon completion of the equipment installation the Contractor shall obtain the services of the factory authorized and trained representative at no additional cost to the owner to perform a start-up of the piece of installed equipment. The factory authorized and trained representative shall submit a certificate or letter stating the equipment has been successfully started, adjusted and tested in accordance with the manufacturer's recommendations. Contractor shall refer to each specification section to determine which equipment/systems require start-up by factory authorized personnel. Some representative equipment/systems which require start-up are listed below.

1. Controls

1.13 O & M INSTRUCTION FORM

A. Contractor shall provide instruction to operating personnel for the minimum hours specified in each specification section.

B. Contractor shall coordinate a schedule of start up/operation and maintenance instruction meetings between the Owner's representatives, various subcontractors and manufacturer's representatives. Submit the following completed form. Some representative systems and equipment are included in the form below, but contractor shall customize the form based on the specific systems and equipment on this project.

OPERATIONAL INSTRUCTION VERIFICATION FORM

Operation and maintenance procedures for major systems and equipment were thoroughly explained to the Representatives as follows:

Equipment Item	Date Instruction Received	Owner's Representative Name (printed)	Owner Representative Initial or Signature
HVAC			
Backflow Preventers			
Pumps			
Heat Exchangers			
Control System			
"I certify that the operation and maintenance procedures of all the major mechanical systems have been thoroughly explained to the Owner's Representative."			
Company:			
Name:			
Title:			
Signature:			
Date:			

1.14 EXTRA MATERIALS AND SPARE PARTS

A. The contractor shall submit a form similar to the one below with a listing of all the spare parts including a description and quantity of each part to the owner for the owner to sign indicating receipt of said parts. Wherever this chart indicates that spare filters are required, the contractor shall note that these spare filters are beyond any filters necessary to protect the unit during construction/start up, and beyond the clean filter in the unit when building is turned over to the Owner. Contractor shall also include their company name, date and signature as outlined below.

TRANSFER OF EXTRA MATERIALS AND SPARE PARTS			
Spec Section	**Total Quantity Received**	**Owner's Rep. Initials**	**Date Received**
PIPING, VALVES & EQUIPMENT			
Provide one(1) readout meter kit for use with Pressure Compensating Flow Control Valves. Provide a separate readout meter kit for with calibrated venturi ball valves and venturis.			
"I certify that the above list of spare parts and materials have been turned over to the Owners Representative."			
Company:			
Name:			
Title:			
Signature:			
Date:			

END OF SECTION 15051

SECTION 15060

HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following hangers, supports and accessories for mechanical system piping and equipment:

1. Coatings
2. Upper attachments
3. Pipe attachment (hangers and clamps)
4. Lower pipe supports
5. Metal framing channel
6. Hanger rods
7. Pipe positioning systems
8. Insulation shields
9. Sleeves
10. Synthetic seals for sleeves
11. Vibration isolators

1.3 PERFORMANCE REQUIREMENTS

A. All supports utilized under Division 15 shall meet the sizing criteria specified herein. No support shall be loaded to more than 20% of its yield strength (thereby providing a safety factor of 5). All support sizes specified herein (for hanger rods, trapeze hangers, pipe attachments, etc.) are minimum sizes required. Contractor shall utilize larger size supports where actual loads dictate a larger support.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 15050.

B. Submit product data on roof equipment curbs and supports, upper attachments, pipe attachments, lower pipe supports, pipe positioning systems, and vibration isolators.

1.5 WELDING REQUIREMENTS

A. Welding Requirements: All welding performed to support Mechanical piping and equipment shall comply with AWS D1.1, "Structural Welding Code - Steel". Welders shall be qualified per AWS and welding certificates shall be posted at the jobsite.

1.6 COATINGS

A. All supports for piping and equipment, hangers and accessories, including but not limited to bolts, nuts, washers, rods, beam clamps, etc. shall be galvanized, except as indicated in the following paragraphs.

B. Hangers and supports in direct contact with copper piping shall be copper plated.

PART 2 - PRODUCTS

2.1 UPPER ATTACHMENT

A. Poured in Place Concrete: Contractor may install concrete inserts or drill concrete anchors. Inserts shall be:

1. B-Line: B 2500
2. C&P: 75
3. Anvil: 281
4. Erico/Michigan: 355
5. PHD: 950, 951

B. Concrete Anchors: Anchors shall be expansion "drop-in" type with an actual load less than 1/3 the manufacturers listed allowable working load for tension in 2,000 psi concrete. Anchors shall be installed in drilled holes per manufacturer's recommendations. Approved manufacturers:

1. Hilti: 5490000
2. Red Head: RM-Multi-Set II
3. Rawl: 6300 Drop-In

2.2 PIPE ATTACHMENT

A. Copper tubing hangers: Size hot, cold and recirculating water pipe hangers to fit piping inside insulation.

1. B-Line: B3170CT
2. C&P: 800CT
3. Anvil: CT-69
4. Erico/Michigan: 101
5. PHD: 152
6. FNW: 7015EC

B. Steel Pipe Hangers: Size uninsulated steel pipe hangers to fit outside the piping. Size insulated steel pipe hangers to fit outside the insulation with insulation shield installed between the hanger and the pipe insulation.

1. For Pipe Sizes 2" and Smaller:

a. B-Line: B3170
b. C&P: 800
c. Anvil: 70

d. Erico/Michigan: 100
e. PHD: 151

2. For Pipe Sizes 2-1/2" and Larger

a. B-Line: B3100
b. C&P: 100
c. Anvil: 260
d. Erico/Michigan: 400, 401
e. PHD: 450, 451

C. Vertical supports shall be:

1. Offset pipe clamp:

a. B-Line: B3148
b. C&P: 179
c. Anvil: 103
d. Erico/Michigan: 700
e. PHD: 535

2. Riser clamp:

a. Steel:

1) B-Line: B-3373
2) C&P: 126
3) Anvil: 2612
4) PHD: 500, 551
5) Erico/Michigan: 510
6) FNW: 7022EP

b. Copper:

1) B-Line: 3373CT
2) C&P: 126CT
3) Anvil: CT121
4) PHD: 552
5) Erico/Michigan: 511
6) FNW: 7023EC

2.3 LOWER PIPE SUPPORTS

A. Pipe Stand Supports:

1. Steel Pipe Saddle Support: Adjustable pipe saddle with factory installed threaded rod and adjustable hex nut. Threaded rod size shall be as determined by manufacturer, and maximum 8" long, and designed for insertion into base stand as scheduled herein. Saddle support shall be B-Line Model B3096 or approved equal by C & P, Anvil, PHD or Erico/Michigan.

2. Steel Base Stand: Factory assembled steel base with pre-drilled holes for anchoring to floor, and with factory installed schedule 40 unthreaded steel pipe, sized to mate with steel pipe saddle support previously specified. Height of pipe shall be determined by contractor. Steel bas stand shall be B-Line Model 3088 or approved equal by C & P, Anvil, PHD or Erico/Michigan.

B. Floor Mounted Pipe Supports (For Piping 1-1/2" and Smaller Only):

1. Upper pipe supports shall be malleable iron extension split pipe clamp, with integral 3/8" threaded rod tapping. Split pipe clamp shall be B-Line Model 3198R or approved equal by C & P, Anvil, PHD or Erico/Michigan.
2. Lower Pipe Support shall be malleable iron ceiling flange with pre-drilled holes for anchoring to floor, and integral 3/8" threaded rod tapping. Malleable iron ceiling flange shall be B-Line Model B-3199 or approved equal by C & P, Anvil, PHD, FNW or Erico/Michigan.

2.4 METAL FRAMING CHANNEL

A. Where possible and practical, piping shall be supported with trapeze hangers consisting of a metal framing system of channel, fittings, and hardware as defined in the Metal Framing Manufacturer's Association Standard Publication MFMA-1. Length of trapeze supports shall not exceed 4 feet unless contractor performs and submits calculations which indicate the channel is within the manufacturer's recommendations with a safety factor of 30% added to the load.

B. Vertical Pipe Supports: Where shown on the drawings, vertical routed piping shall be supported and/or stabilized by steel channel meeting the requirements for channel as specified herein.

C. Channel shall be constructed of 12 gauge steel. Nominal width shall be 1-5/8" x 1-5/8" with a 9/16" wide and 7/8" long slot face opening, with slots on 2" centers. Channel shall be pre-galvanized in accordance with ASTM A 653 G90, or have a factory applied electro-deposited epoxy finish.

D. Pipe clamps shall be sized as follows:

1. Non-insulated Steel Piping: Sized to fit piping.
2. Insulated Piping: Sized to fit outside of insulation.
3. Copper Piping: Sized to fit outside of piping plus elastomeric isolation material.

E. Approved Manufacturers: B-Line Model B22SH, Elcen, Unistrut, and Superstrut by Midland-Ross.

2.5 HANGER RODS

A. Steel Hanger Rods: Continuous threaded rod. Size as indicated in individual piping specification sections.

B. Rods supporting trapeze hangers shall be 1/2" unless actual loads dictate a larger rod. Rods supporting mechanical equipment shall be sized in accordance with the manufacturer's installation instructions. If no size is given, rod size shall be minimum 3/8", unless actual load dictates a larger rod. No support shall be loaded to more than 20% of its yield strength (thereby providing a safety factor of 5).

C. Rod couplings shall be:

1. B-Line: B3220
2. C&P: 167
3. Anvil: 136, 136R
4. Erico/Michigan: 26
5. PHD: 100, 105

2.6 PIPE POSITIONING SYSTEMS

A. Definition: A combination of straps, brackets and clips designed to correctly locate pipes in walls relative to fixtures or equipment.

B. Metal Components: Metal components of the system must be pre-galvanized steel ASTM A446 Grade A or better. Metal parts in contact with copper pipe shall be copper plated steel ASTM A611 Grade C or better. All metal components must be stamped with the manufacturer's name and part number and the UPC certification mark.

C. Plastic Components: Plastic components shall be made of polypropylene or Lexan 141 with a flame retardant rating UL94V2 or better. All plastic parts must be stamped with the manufacturer's name and part number.

D. Manufacturers: B-Line RufflinJ, Holdrite Corp by Hubbard or equal by Erico/Michigan.

2.7 INSULATION SHIELD

A. Provide insulation shields at all pipe hangers installed on the exterior of the insulation and at all pipe clamps and trapeze supports. Shields shall be fabricated from minimum 18 gauge galvanized steel. Shields at pipe hangers shall be 12" long with a 180 degree arc. Shields at pipe clamps shall cover entire pipe. Contractor may utilize the following shields:

1. B-Line: B3151
2. C&P: 265P
3. Anvil: 167
4. Erico/Michigan: 121
5. PHD: 170
6. FNW: 7750

2.8 SLEEVES

A. Pipe Sleeves:

1. Pipe sleeves thru floors shall be fabricated from schedule 10 (minimum) steel pipe, and shall extend 1 inch above floor. Pipe sleeves thru walls shall be fabricated as shown on mechanical drawings. Sleeve shall be flush with both sides of walls, unless noted otherwise on drawings. Sleeves on copper piping through slab on grade shall be Schedule 40 PVC (minimum). Omit sleeves on sanitary waste and vent and storm drain pipe penetrations thru slabs on grade.
2. Pipe sleeves for refrigerant piping thru walls shall be fabricated of 20 gauge galvanized sheet metal, size approximately 3-1/2" x 3-1/2" (or wider if necessary) to match brick coursing. Sleeve shall be flush with both sides of walls.

2.9 VIBRATION ISOLATORS

A. General: Furnish and install vibration isolators for equipment as listed below. All isolation devices shall be selected for uniform static deflections according to distribution of weight and for the lowest disturbing frequency of the unit.

B. Isolator Types:

1. Type 3 Isolators: Combination spring and fiberglass (or neoprene) hangers, incorporating pre-compressed molded fiberglass (or neoprene) noise and vibration isolation pads, coated with a moisture impervious elastomeric membrane in series with springs, all encased in welded steel brackets. The spring shall have a lateral spring stiffness greater than 0.8 times the vertical stiffness. Isolators shall be designed for 50% overload capacity and shall accommodate rod misalignment over a 30 degree arc. Isolators shall have a minimum static deflection of 3/4".

C. Piping Isolation: Suspended HVAC piping 1" diameter and over in the mechanical equipment rooms shall be isolated from the structure by means of vibration and noise control isolators. This shall apply to the first two hangers on either side of the pumps. Suspended piping shall be isolated with Type 3 isolators. A combination clevis/pre-compressed isolator is acceptable in lieu of separate clevis and separate Type 3 isolators.

D. Manufacturers: The vibration isolators shall be manufactured by Peabody Noise Control, AVNEC, Mason, Vibration Isolation Co. Inc., Amber Booth, Vibro Acoustics, Vibration Mountings, Vibration Eliminator Company, Korfund, Kinetics or IAC. Isolators meeting the specification requirements which are engineered and approved by the equipment manufacturer may also be furnished by the equipment manufacturer.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support spacing requirements are specified in Sections specifying piping systems and equipment.

B. Use galvanized hangers and supports for piping and equipment that will not have field-applied finish.

C. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

D. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Hanger Shield Installation: Install shield in pipe hanger or shield for insulated piping.

D. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

E. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

F. Install lateral bracing with pipe hangers and supports to prevent swaying.

G. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, 2-1/2" and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

H. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

3.3 PIPE HANGER ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.4 PAINTING

A. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Painting Section.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

C. In areas that are to be painted and also are exposed to view in public areas, supports for piping and equipment, hangers and accessories including but not limited to bolts, nuts, washers, rod, angle iron, beam clamps, etc. shall be plain steel with a coat of rust inhibiting primer. Primer shall be applier prior to installation of supports. Supports, hangers and accessories exposed to view shall not be galvanized or electroplated, in order to allow them to be painted in accordance with the Architectural painting section. Areas that are to be painted but that are not exposed to view to the public, such as mechanical rooms, shall be galvanized as required above.

3.5 SLEEVES AND PENETRATIONS

A. Provide pipe sleeves for all piping and conduit penetrations through floors and walls.

B. Set sleeves in position during construction of walls or floors prior to placement of brick, concrete block or cast-in-place concrete.

C. Piping and Conduit Penetrations through Non-rated Walls or Floors: Pack space between pipe or conduit and sleeve with fiberglass batts and with a minimum of 1 inch thick, non-sagging caulking material on one side. Caulk material is not required to be fire rated, but shall comply with Architectural caulking specification section.

D. Install chrome plated steel escutcheons at finished surfaces for piping.

E. Division 15 Contractor shall furnish the General Contractor with the clear opening dimensions and elevations and locations of all penetrations through walls and floors, so that the General Contractor may provide appropriate wall and floor openings for these penetrating items. Penetrating items include, but are not limited to, ducts and piping. Clear opening dimensions and elevations and locations shall be furnished in a timely manner to allow General Contractor to frame openings during wall and floor construction, and to prevent the need for removing new work. Contractor is warned that the project may contain shear walls which require steel reinforcing/framing around perimeter that must be installed during the construction of the wall, and which can not be installed after the wall is constructed without significant demolition of the wall and reconstruction of the wall. Coordinate with General Contractor to determine location of shear walls.

3.6 SUSPENDED EQUIPMENT, DUCTWORK AND PIPING SUPPORTS

A. Provide steel drop rod supports or angle iron supports, secured (spot welded or clamped in bar joist areas) to building main structural components for all suspended mechanical equipment, ductwork and piping. Supplemental angle iron framing shall be provided where required between bar joists and shall be minimum 3 x 3 x 1/4 for equipment and large piping (4" and larger), and minimum 2 x 2 x 1/4 for large ductwork, small equipment and small piping, and 2 x 2 x 1/8 for small ductwork and refrigerant and condensate drain piping. 1-5/8 x 1-5/8 x 12 gauge channel may be used to span bar joist in lieu of 2 x 2 x 1/4 angle provided that previous paragraph “Performance Requirements” are met. Contractor shall note that supplemental angle sizes are minimum. Contractor shall provide larger size supplemental angle iron framing as appropriate to safely and appropriately support equipment. Provide vibration isolation where specified. Coordinate all mechanical equipment, duct and pipe supports with steel fabricator/erector and do not overload any building structural members or supplemental framing members. Provide securely tightened lock nuts on all drop rod supports and connections.

B. For suspended water source heat pumps being installed in a location where water source heat pump was removed during demolition, the contractor has the option of reusing the upper support system (i.e., supplemental angle iron, supplemental channel, beam clamps) if the upper support system allows proper installation of new WSHP. Proper installation includes meeting manufacturer's installation requirements, not blocking access panels, and allowing rods to drop vertically downward with no angular installation. If proper installation is not possible, provide new upper supports.

END OF SECTION 15060

SECTION 15075

MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:

1. Equipment nameplates.
2. Equipment markers.
3. Pipe markers.
4. Valve tags.

1.3 SUBMITTALS

A. Product data for each type of product included herein shall be submitted under provisions of Section 15050.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. General: Provide nameplates for all equipment and panel mounted controls. Location shall be accessible and visible.

B. Equipment Nameplates: Metal with data engraved or stamped, permanently attached to equipment. As a minimum, nameplate shall include manufacturer, model number, serial number and electrical data.

2.2 EQUIPMENT MARKERS

A. Markers shall be Contractor fabricated to have equipment “tag” or number (e.g., EF-1, AHU-2, etc.) on marker.

B. Designation:

1. Equipment tag shall be etched in 1/4" maximum, 1/8" minimum height letters and mounted on or adjacent to device cover or attached to the item of equipment. For items above ceiling, marker shall be attached to ceiling on t-bar grid in location approved by Owner.
2. Type: White core black bakelike secured with epoxy glue or screws, unless otherwise noted.

2.3 IDENTIFICATION OF PIPING

A. Piping shall be labeled with pre-tension pre-coiled semi-rigid plastic snap-on pipe markers equal to Seaton "Setmark" pipe markers or by Brimer or Brady, or self adhesive plastic pipe markers with pressure sensitive, permanent type self-adhesive back, or field stenciled if pre-made marker is not manufactured. Provide arrow identifying direction and system description as listed below. Background and letter colors shall be in conformance with latest version of ANSI/ASME A13.1. The following piping systems shall be provided with pipe markers.

1. Domestic cold water
2. Domestic hot water
3. Domestic hot water return
4. Gas
5. Heating hot water
6. Steam
7. Steam condensate

B. Height of letters shall be as follows:

1. Outside Diameter (Outside insulation on insulated piping)

a. 1/2" - 1-1/4": Letter height shall be 1/2"
b. 1-1/2" to 2": Letter height shall be 3/4"
c. 2-1/2" to 6": Letter height shall be 1-1/4"
d. 8" to 10": Letter height shall be 2-1/2"
e. Over 10": Letter height shall be 3-1/2"

PART 3 - EXECUTION

3.1 EQUIPMENT IDENTIFICATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible.

B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.

1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
2. Data: Equipment “tag”.
3. Locate markers where accessible and visible.

C. The following pieces of equipment located above ceilings shall be identified with bakelite label equipment markers attached to the ceiling grid in a location approved by the Owner, near the equipment.

1. Each group of piping isolation valves for heating hot water and domestic water systems.

3.2 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pre-tensioned pipe markers. Use size to ensure a tight fit.
2. Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 3/4 inch wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.
3. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.
4. Pipes with OD, Including Insulation, 6 Inches and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 3 inches at both ends of pipe marker, and covering full circumference of pipe.

B. Stenciled Pipe Marker Option: Stenciled markers may be provided where manufactured pipe markers are not available. Install stenciled pipe markers with painted, color-coded bands or rectangles complying with ASME A13.1 on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. Locate pipe markers and color bands as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. At access doors, manholes, and similar access points that permit view of concealed piping.
4. Near major equipment items and other points of origination and termination.
5. At 25 feet intervals on all straight runs of pipe.
6. On both sides of walls or floors where pipe passes through walls or floors.

3.3 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule:

1. Valve-Tag Size and Shape: All tags shall be 2” round.
2. Valve-Tag Color: Natural brass

3.4 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.5 CLEANING

A. Clean faces of mechanical identification devices to an “as new” condition immediately prior to Architect’s Final Certification.

END OF SECTION 15075

SECTION 15080

MECHANICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes mechanical insulation for duct, equipment, and pipe, including the following:

1. Insulation materials
2. Fitting materials.
3. Insulation finish materials
4. Accessories

1.3 SUBMITTALS

A. Product data shall be submitted under provisions of Section 15050 for each type of product indicated; identify thermal conductivity, thickness, and jackets (both factory and field applied, if any). Provide a sheet that identifies each system (e.g., cold water piping, supply duct, etc.), and the submitted material, thickness, and finish for each system.

B. Submit proof of three years minimum experience in insulation installation.

1.4 QUALITY ASSURANCE

A. Insulation and related materials shall meet the requirements of NFPA-90A.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing products per ASTM E 84. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Applicator: Company specializing in insulation application with three years minimum experience.

1.5 GENERAL INSULATION NOTES

A. Any HVAC equipment which is factory insulated, and which has sweating/condensation forming on the equipment while operating under design conditions, shall be replaced or field insulated by the contractor until the condensation is eliminated.

B. Piping and ductwork is considered concealed for purposes of this Specification Section when located above ceilings or in chases.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Certain Teed, Owens-Corning, Johns Manville, Armacell, IMCOA, Nomaco, Knauf, Pittsburg Corning, The Dow Chemical Company, Dyplast, Foster, Childers and Hi-Therm.

B. Substitutions: Under provisions of Section 15010.

2.2 INSULATION MATERIALS

A. I1: Glass fiber insulation; ANSI/ASTM C547; 'k' value of 0.24 at 75 degrees F. Jacket shall be factory applied all service jacket with self sealing lap (ASJ-SSL). Provide ASJ tape where insulation butts. Provide 12" of type I7 insulation at hangers installed on the exterior of the insulation on piping sizes 2" and larger. ASJ jacket shall be continuous. Provide insulation shield on exterior of insulation at all hangers.

B. I2: Preformed flexible elastomeric expanded closed-cell pipe insulation having a flame spread rating of 25 or less and a smoke density of 50 or less when tested by ASTM E-84 method. Temperature range -40°F to 220°F. Insulation shall be CFC and HCFC free and formaldehyde free. Thermal conductivity of 0.27 btu-in/hr sq. ft °F at 75°F mean temperature. All seams and butt joints shall be sealed with factory applied adhesive. Provide insulation shield on exterior of insulation at all hangers.

C. I3: Blanket Insulation: Glass fiber blanket insulation minimum 3/4 lb. density, installed R3.5 per inch, with FSK facing. On ductwork, wrap blanket insulation around duct, being careful not to compress it more than 25% at the corners, butting insulation and overlapping facing jacket 2" minimum at all joints. Two-inch (2") thick insulation shall have a minimum R5.3 at 25% compression. Where scheduled, provide 3" thick insulation with installed R8.0. Staple the overlap with outward clinching staples a maximum of 3" on centers. For ducts over 30" wide, additionally support insulation on bottom of horizontal ducts and sides of vertical ducts with rows of welded or adhered clips and washers on not more than 18" centers. Seal all joints and clips with pressure sensitive FSK tape. Seal all penetrations, such as at duct supports, and all terminations of insulation with pressure sensitive FSK tape. When blanket insulation is used on storm drain system, blanket shall cover roof drain body, vertical pipe from roof drain body to horizontal piping and all horizontal piping. Install similar to duct systems.

D. I7: Cellular Glass Insulation: Molded rigid sectional 8 lb. minimum density cellular glass insulation. Seal all joints with flexible joint sealer. Secure insulation with 3/4" wide aluminum bands. Finish insulation with white vapor barrier coating reinforced with glass cloth. ANSI/ASTM C552.

2.3 FITTING INSULATION MATERIALS

A. Type P1: Precut fiberglass insulation fitting inserts covered with PVC fitting covers. PVC fitting covers shall have a flame spread of 25 or less and a smoke development of 50 or less. Nominal 0.75 lb. density, K factor maximum 0.32 at 75°F for temperatures -20°F to 450°F.

B. Type P2: Precut cellular glass insulation fitting inserts with vapor barrier.

2.4 INSULATION FINISH MATERIALS

A. F1: Two coats of Armacell Armaflex finish or equal

B. F2: Pre-molded PVC jacket, maximum permeance of 0.09. PVC jacketing shall be minimum 0.02" thick (20 mils).

C. F3: Fungus Resistant, white or gray vapor barrier mastic with 10 x 10 glass cloth or polyester reinforcing membrane to develop 37 mil dry film thickness. Foster Vapor Safe 30-80 AF conforming to ASTM D 5590 with 0 rating and Chil Glas #10 reinforcing mesh or prior approved equals..

2.5 ACCESSORIES

A. Insulation Bands for Cellular Glass: 3/4 inch wide; 0.015 inch thick aluminum.

B. Metal Jacket Bands: 1/2 inch wide; 0.015 inch thick aluminum.

C. Adhesives: Compatible with insulation materials, jackets and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

D. Insulation Shields: Provided in accordance with Section 15060.

E. Mastics: Materials shall be compatible with insulation materials, jackets, and substrates.

F. Tapes: FSK foil face, vapor retardant type tape matching factory applied jacket with acrylic adhesive; complying with ASTM C1136 and UL listed. Width shall be three inches; thickness shall be 6.5 mils.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 COORDINATION

A. Coordinate with contractor to confirm (based on contractor's preference) which sections of piping will be welded and which sections of piping shall be grooved. See Part 3 - "Execution" herein for additional insulation requirements specific to grooved piping system.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Coordinate with trade installing piping to verify all piping has been pressure tested prior to application of insulation.

3.3 COMMON INSTALLATION REQUIREMENTS

A. Install insulation, fitting materials, finish materials and accessories in accordance with manufacturer's installation requirements and recommendations.

B. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

C. Install insulation with longitudinal seams at top and bottom of horizontal runs. Install multiple layers of insulation with longitudinal and end seams staggered. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

D. Keep insulation materials dry during application and finishing.

E. Install insulation with least number of joints practical.

F. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic (Type F3).

G. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

H. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

I. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

J. On insulated piping without vapor barrier and piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation with mastic (Type F3) at such locations.

K. For above ambient service, do not install insulation to vibration control devices, testing agency labels, nameplates or cleanouts ASME stamps, etc.

3.4 INSULATION SCHEDULE

Service/Location	INSULATION Pipe/Duct	Fitting	Thickness	FINISH Pipe/Duct	Fitting
PIPING:					
Hot, Cold & Recirculating Water Piping:					
Exposed	I1	P1	1"	--	--
Space Heating Hot Water Piping:					
Exposed Inside, 1/2" to 1"	I1	P1	1/2"	F2	P1
Exposed Inside, 1-1/4" to 2"	I1	P1	1"	F2	P1
Exposed Inside, 2-1/2" and up	I1	P1	1-1/2"	F2	P1
Steam and Steam Condensate Piping Exposed Outdoors	I2	I2	2"	F1	F1
Steam and Steam Condensate Piping Underground	Pre-insulated Piping System				
Expansion Tank Piping Serving Hot Water System	Same as Hot Water Piping System				

EQUIPMENT:

Mechanical Equipment	Shall have factory installed insulation to prevent condensation or excessive heat loss/gain
Hot Water Expansion Tanks	One inch of type I4 with F1 finish
Hot Water Air Separators	One inch of type I4 with F1 finish
Shell & Tube Heat Exchangers	I9, 1-1/2" with F3 finish

END OF SECTION 15080

SECTION 15110

VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following general-duty valves:

1. Ball valves.
2. Butterfly valves.
3. Ball valves with electric actuation.
4. Gate valves.
5. Check valves.

1.3 SUBMITTALS

A. Product data for each type of valve indicated shall be submitted under provisions of Section 15050.

1.4 QUALITY ASSURANCE

A. ASME Compliance: ASME B31.9 for building services piping valves.

1. Exceptions: Domestic hot- and cold-water piping valves unless referenced.

B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.5 STORAGE

A. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 SHUT OFF VALVES

A. Shut off valves for the (domestic and heating) hot water, recirculating hot water, tempered water, cold water, condenser water, cooling water, chilled water, and loop water systems shall be:

1. Ball Valves: 2" and smaller; 400 psi WOG; standard port, 2-pc. bronze construction, blow-out proof stem, solder or threaded ends as applicable. Provide chrome plated forged brass ball. Provide teflon (TFE) packing and packing nut to allow stem leakage correction. "O" ring seals are not allowed. Valve shall conform with MSS-SP110. Provide a stem extension on insulated piping. Length of extension shall be a minimum of 2-1/4". If stem extension is not factory installed, contractor shall field install stem extension.

   a. FNW: 421
   b. Milwaukee: BA250/BA200
   c. Hammond: 8211/8201
   d. Stockham: S-255/T-255
   e. Flow Design: HB
   f. Watts: B-6001/B-6000
   g. Kitz: 69/68
   h. Apollo: 70-200-01, 70-100-01

2. Butterfly Valves: 2-1/2" to 12": 200 psi cwp (cold working pressure), 200 WOG, 230°F maximum temperature, lug or grooved style, ductile iron body, extended neck, EPDM liner, stainless steel one-piece stem, bronze or aluminum or electroless nickel coated ductile iron disc, lever lock, adjustable memory stop. All butterfly valves shall have bubble-tight shut-off at full pressure rating, and be suitable for bidirectional dead end service at 200 psi without the need for a downstream flange. Butterfly valves shall conform with MSS-SP67. Provide gear driven hand wheel for all valves 6" and larger. Provide lever lock with adjustable memory stop for valves 5" and smaller.

   a. Nibco: LD-2000
   b. Crane: 14-N-TL
   c. Stockham: LD-752-B53-E
   d. Hammond: 6211
   e. Centerline: Series A
   f. Victaulic: 300
   g. Watts: BF03-121-15
   h. Mueller: 56ANK6-1
   i. Apollo: LD141
   j. Kitz: 6122E
   k. SSI: 125LD
   l. FNW: 732E

3. High Performance Butterfly Valves: 2-1/2" and larger: Class 150 WOG, MSS SP-68, 500°F maximum temperature, carbon steel body, lug style, extended neck, stainless steel trim, PTFE seats, lever lock, standard lever.

    a. Dezurik: HP II Butterfly Valve
    b. McCannalok: High Performance Butterfly Valves
    c. Crane: Flowseal
    d. Stockham: 17A121RTG-HD
    e. FNW: FNWHP

2.2 ELECTRICALLY ACTUATED SHUT-OFF VALVES

A. Shut-Off valves for water to student tables in Science Labs:

1. Water Valves: Ball valves shall be as specified herein for water service with electric actuation. Actuator shall be 120 volt with NEMA 4 enclosure. Valve shall be normally closed.

2.3 STEAM SHUT-OFF VALVES

A. Shut-off valves for the steam and steam condensate shall be:

1. Gate Valves: 200 psi WOG; non-rising stem, solid-wedge; threaded ends and screw-in bonnet on sizes 2" and smaller, flanged ends and bolted bonnet on sizes 2-1/2" and larger.

    a. 2" and Smaller:

        1) Nibco: S-113 and T-113
        2) Crane: 1320
        3) Hammond: IB647
        4) Stockham: B-103 and B-104
        5) Milwaukee: 115
        6) Watts: B-3001
        7) Kitz: 40
        8) FNW: 1211

    b. 2-1/2" and Larger:

        1) Nibco: F-619
        2) Crane: 461
        3) Hammond: IR1138
        4) Stockham: G-612
        5) Milwaukee: F-2882-M
        6) Watts: F-502
        7) Kitz: 72
        8) FNW: 651

2.4 CHECK VALVES

A. Check Valves 2" to 12": 200 psi WOG; horizontal swing 2" and smaller; regrinding type, renewable discs, Y-pattern, solder ends. 2-1/2" and larger; bolted bonnet, renewable seat and discs, or aluminum bronze or EPDM coated ductile iron disc with PPS coated or welded on nickel seat, flanged ends.

1. 2" and Smaller:

    a. Apollo: 161S or 161T
    b. Nibco: S-413 or T-413
    c. Crane: 34
    d. Hammond: IB 912
    e. Stockham: B-319Y and B-309Y
    f. Victaulic: --
    g. Anvil: --
    h. Kitz: 23
    i. Milwaukee: 509 and 1509
    j. FNW: 1241

2. 2-1/2" and Larger:

    a. Apollo: 6SC-10X (910F Series)
    b. Nibco: F-918
    c. Crane: 373
    d. Hammond: IR 1124
    e. Stockham: G931
    f. Victaulic: 716
    g. Anvil: ---
    h. Kitz: 78
    i. Milwaukee: F-2974
    j. FNW: 671

B. Check Valves 14" and Larger: 125 psig, 200 degrees F maximum temperature, twin disc, wafer style, silent type, aluminum bronze disc, cast iron body, Buna-N Seat stainless steel spring actuated, horizontal or vertical swing. Nibco Model W-920-W or equal by Crane, Mueller, Hammond, Stockham WG-970 or Victaulic.

2.5 BALL VALVE WITH TAMPER SWITCH

A. 2" and Smaller: Bronze body, U.L. listed - F.M. approved, Full Port Ball Valve. NIBCO T-505-4 or equal by Crane or Hammond. Tamper switch shall be built in to the valves; U.L. Listed - F.M. Approved.

1. Switch designed for installation on indicator valves with cased aluminum housing with red finish; U.L. Listed - F.M. Approved. Notifier, Simplex or equal.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install Swing Check Valves in horizontal position with hinge pin level.

F. Install triple duty valves and check valves 5 pipe diameters minimum downstream from pump discharge or elbows to avoid flow turbulence. For horizontal applications, valves shall be installed with disc hinge pin in vertical position. Provide minimum companion flange bore to allow proper operation of disc.

G. Where flanged connections are provided to connect butterfly valves to other flanged piping components, the contractor shall provide spool pieces as necessary to allow the disc to extend to the fully open position.

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

I. All butterfly valves 6 inches and larger shall be provided with gear driven hand wheels.

J. All valves, manually operated, 6-inches and larger located 12 feet or more above the finished floor elevation in the mechanical room shall be installed with their spindles horizontal and provided with chain wheels. Chains shall loop within four (4) feet of the finished floor. Provide holding clips to secure chains when the valve is not being used.

K. Use ball valves (or butterfly valves, as specified) for shutoff and to isolate equipment, to isolate systems and vertical risers.

3.2 JOINT CONSTRUCTION

A. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 15110

SECTION 15122

METERS AND GAUGES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following meters and gauges for mechanical systems:

1. Pressure gauges.
2. Pressure snubbers.
3. Gauge Cocks.
4. Stem type thermometers.
5. Separable socket wells.
6. Pete’s (P & T) plugs.
7. Steel venturis.
8. Read out meter for Venturis.
9. Read out meter for pressure compensating flow control valves.

1.3 SUBMITTALS

A. Product data shall be submitted under provisions of Section 15050. For each type of product herein, include performance curves.

B. Shop Drawings: Schedule for thermometers and gauges indicating manufacturer's number, scale range, and location for each. Identify the specific ranges for the equipment used on this project for thermometers and gauges. Submittals showing thermometers and gauges with multiple sizes, ranges, materials, etc., without showing specific sizes, ranges, materials, etc., for this project will be rejected.

C. Operation and maintenance data shall be submitted under provisions of Section 15051.

PART 2 - PRODUCTS

2.1 DIAL TYPE PRESSURE GAUGES

A. General: Case constructed of brass or cast aluminum or stainless steel, back flange for surface mounting, flangeless for remote mounting, rattle-proof glass or acrylic window held in place with an "0" ring and screwed ring, black scale graduations on a white background and adjustable pointer. Socket and tip to be stainless steel or brass, threaded 1/4" NPT. Bourdon tube to be phosphor bronze or stainless steel with brass movement. Gauge to be 4-1/2" diameter. Provide pressure snubber and gauge cock for each pressure gauge. Units for all gauges shall be in English (PSI).

B. Ranges:

1. Pumps: Where a specific range is not listed below, range selected so that suction pressure is above lower 20% and discharge pressure is below upper 20% of scale. Both suction and discharge scale ranges shall match.

   a. Condenser Water Pumps: 30 in Hg vacuum to 60psig.
   b. Chiller Water Distribution Pumps: 0 to 100 psi.
   c. Chiller Water Chiller Pumps: 0 to 60 psi.
   d. Hot Water Pumps: 0 to 100 psi.
   e. Chilled Water Pumps: 0 to 100 psi.
   f. Loop Water Pumps: 0 to 100 psi.
   g. Cooling Water Pumps: 30 in Hg vacuum to 60psig.

2. Bladder Expansion Tank: Range shall be 0 to 60 psig.
3. Pressure Reducing Valves on Domestic Water and at Make-up Water Station: Range shall be 0 to 150 psig.
4. Steam: Range shall be 0 to 100 psig.
5. Tangential Particle Separator: 0 to 100 psig.
6. Basket Strainer: Range shall be 30 in Hg vacuum to 2 psig.

C. Manufacturers: Dial type pressure gauges shall be manufactured by Ashcroft, Trerice, Weksler, FNW, Weiss, Palmer or Moeller.

2.2 PRESSURE SNUBBER

A. Brass or stainless steel with threaded 1/4" NPT connection designed to prevent shock to gauge with porous corrosion resistant metal pressure filler. Provide porous disc for steam or water service as appropriate. Trerice Model No. 872-1 or 872-4 (air and gases) or Model No. 872-2 or 872-5 (water and steam), Weis Model PSN, FNW Model PSB, Ashcroft Model 25, or equal by Palmer or Weksler Model BW-42 or SW-42.

2.3 GAUGE COCKS

A. 200 SWP. 400 WOG, threaded ends, threaded bonnet, bronze body, needle point bronze stem and bronze seat, hand wheel handle, gland packed. Size shall be 1/4".

1. Nibco: T-256-AP
2. Hammond: IB-415
3. Crane: 88
4. Milwaukee: 600
5. Stockham: B-64
6. Treice: 735-2 (Brass)
7. Weksler: AV-34
8. Weiss: 25NVBR
9. FNW: NVB

2.4 STEM TYPE THERMOMETERS

A. General: Adjustable angle industrial type constructed of brass or cast aluminum (no plastic allowed) case, rattle-proof glass window, black scale graduations and red reading mercury tube. Stem to be constructed of brass or stainless steel, with 3/4" thread for use with separable socket well. Scale to be 7" long with 3-1/2" long stem.

B. Ranges:

1. Condenser Water: 30° to 130°F in 1° divisions.
2. Chilled Water: 0° to 100°F in 1° divisions.
3. Domestic and Heating Hot Water: 30° to 240°F in 2° divisions.
4. Cooling Water: 0° to 100°F in 2° divisions.
5. Loop Water: 0° to 100°F in 2° divisions.
6. Steam: 30° to 300°F in 2° divisions.

C. Manufacturers: Stem type thermometers shall be manufactured by Ashcroft, Trerice, Weksler, FNW, Weiss, Palmer or Moeller.

2.5 SEPARABLE SOCKET WELLS

A. Provide for all thermometers and control bulbs mounted in piping. Wells shall be constructed of brass or stainless steel, be furnished complete with screwed cap and shall have lagging extension. Wells shall be suitable for 3-1/2" stems. Where wells are installed in straight runs of pipe smaller than 2-1/2", increase pipe size to 2-1/2" for minimum 4" either side of well. Wells shall be installed at 45 degrees or greater above horizontal and be filled with SAE 10 W oil.

2.6 PRESSURE - TEMPERATURE PLUGS

A. Pressure temperature plugs shall be solid brass having a double Nordel seat suitable for temperatures of 275°F and 500 PSI., each plug shall have a color coded cap retainer for easy identification, (Yellow for Nordel, Blue for Neoprene). Provide extended neck type on insulated piping. Plugs shall be #110 (1/4") or #710(2") "Pete's Plug II" as manufactured by Peterson Equipment Co, Superseal Model by Flow Design or equal by Nexus, FNW, Palmer or Weksler.

2.7 STEEL VENTURIS

A. Carbon steel venturi with high signal/low loss design with ASTM A-120 body, rated at 400 psig at 250°F, with three port averaging throat signal, grooved or Schedule 40 welded ends, with two 1/4" Schrader type brass access ports with caps. Accuracy shall be +3% of full scale. Venturi shall be installed with manufacturer's required pipe diameters upstream and downstream, but as a minimum shall have five pipe diameters upstream of venturi. Venturis shall be manufactured by Flow Design, Inc., Pro Hydronics, Barco, Preso, Hydronic Components, Inc. (HCI), Griswold or Garand. Venturi shall be utilized with read out meter kit specified to directly measure gpm, or with differential pressure transmitter to send gpm signal.

2.8 READ OUT METER KIT FOR CALIBRATED VENTURIS AND CALIBRATED VENTURI/BALL VALVES

A. Provide to the owner a portable read out meter kit by the manufacturer of the calibrated venturis and venturi/shut-off valves. Meter shall serve to verify flow rate (gpm). Unless specifically shown otherwise on the drawings, flow rate shall be automatically set by the pressure compensating flow control valves. If pressure compensating flow control valve is over flowing, ball valve may be used to reduce flow to scheduled gpm, otherwise, valve shall be in the fully open position.

B. The meter shall be housed in a durable case complete with two ten foot color coded hoses with P/T adapters and shut-off valves at the end that connects to the venturi and venture/ball valves so that water does not drain out between readings.

C. Meter shall have a six inch diameter face and $\pm$1.75% full scale accuracy. Range of meter shall be 0 to 300 inches w.c. (0 to 25 feet).

D. Meter shall be provided with a removable transparent face indicating flow directly in GPM for each size device furnished.

E. Meter shall have a forged brass body and a three-valve manifold for over-range protection.

F. Meter shall have a dual scale reading inches and feet W.C.

G. Meter for calibrated balancing venturi/ball valves shall be manufactured by Flow Design, Griswold, Nexus, Hydronic Components, Inc. (HCI), Bell & Gossett or Tour & Anderson.

2.9 READ OUT METER KIT FOR PRESSURE COMPENSATING FLOW CONTROL VALVES

A. Provide to the owner a portable read out meter kit by the manufacturer of the pressure compensating flow control valves. Meter shall serve to verify that the differential pressure is within the specified spring range, which shall indicated whether the valve is underflowing, correct or overflowing. Actual flow rate (gpm) shall be verified by a separate meter kit as specified herein for the calibrated venturis and calibrated venturi/ball valves.

B. The meter shall be housed in a durable case complete with two ten foot color coded hoses with P/T adapters and shut-off valves at the end that connects to the valves so that water does not drain out between readings. Provide bleed valve at gauge manifold.

C. Meter shall have a 4-1/2" diameter face. Range of meter shall be 0 to 35 psid for 2-32 spring range. If alternate spring range is specifically shown on the drawings, range of meter shall be 0 to 65 psi for spring ranges up to 60 psi.

D. Meter shall be provided with a removable transparent face indicating flow directly in GPM for each size device furnished.

E. Meter shall have a forged brass body and a three-valve manifold for over-range protection.

F. Meter shall have a dual scale reading inches and feet W.C.

G. Meter for pressure compensating flow control valves shall be manufactured by Flow Design, Nexus, Hydronic Components, Inc. (HCI), Griswold or Tour & Anderson.

PART 3 - EXECUTION

3.1 INSTALLATIONS

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

B. Install direct-mounting pressure gauges in piping tees with pressure gauge located on pipe at most readable position.

C. Install gauge cock and pressure snubber fitting in piping for each pressure gauge.

D. Install pressure - temperature plugs in tees in piping, or in weldolets or threadolets.

E. Install flow indicators, in accessible positions for easy viewing, in piping systems.

F. All gauges, flow meters, venturis, etc. shall be installed in accessible locations in accordance with manufactures instructions.

3.2 CONNECTIONS

A. Install meters and gauges adjacent to machines and equipment to allow service and maintenance for meters, gauges, machines, and equipment.

3.3 ADJUSTING

A. Calibrate meters according to manufacturer's written instructions, after installation.

B. Adjust faces of meters and gauges to proper angle for best visibility.

END OF SECTION 15122

SECTION 15140

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes domestic water piping inside the building.

1.3 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings shall be submitted under provisions of Section 15050.

1.4 QUALITY ASSURANCE

A. All piping and fittings shall be new and of domestic (USA) manufacturer. The ASTM number and schedule shall be stamped on each length of piping.

B. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Section 15050.

B. Store and protect products under provisions of Section 15050.

PART 2 - PRODUCTS

2.1 140°F HOT, 120°F HOT, COLD AND RECIRCULATING WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88 type 'L' hard drawn. Fitting: ANSI/ASME B16.9 pressure pattern wrought copper. Joints 2" and smaller: ANSI/ASTM B32 Lead free solder, having a composition of 95.5% tin, 4% copper and 0.5% silver. Joints over 2": Braze using AWS A.58 BCUP – 4 silver (minimum 5.8%) filler metal. “Backing” with solder (melting temperature less than 1,100˚F) is prohibited.

B. On piping 2" and larger, the Contractor has the option of using grooved couplings and grooved fittings as manufactured by Victaulic, Anvil and Grinnell.

C. In lieu of manufactured copper tee fittings, the Contractor has the option of using mechanically formed tee connections. Mechanically formed tees shall conform to the following:

1. Mechanically extracted collars shall be formed in a continuous operation consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the tube wall. The collaring device shall be fully adjustable as to insure proper tolerance and complete uniformity of the joint.
2. The branch shall be notched to conform with the inner curve of the run tube and dimpled to insure penetration of the branch tube into the collar is of sufficient depth for brazing and that the branch tube does not obstruct the flow in the mainline tube. Dimples shall be in line with the run of the tube and visible through the braze. All joints shall be brazed with BCUP-2 braze. The method shall be provided by T-drill7.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 PIPE AND FITTING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Grooved joints may be used on aboveground grooved-end piping.

D. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

E. Install unions downstream of valves and at equipment or apparatus connections.

3.3 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
2. Hot-Water-Piping, Balancing Duty: Balancing valves.
3. Drain Duty: Hose-end drain valves.

B. Cast-iron, grooved-end valves may be used with grooved-end piping.

C. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 2 and smaller. Use butterfly valves for piping NPS 2-1/2 and larger.

D. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

1. Install hose-end drain valves at low points in water mains, risers, and branches.
2. Install stop-and-waste drain valves where indicated.

E. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Balancing valves are specified in Division 15 Section "Domestic Water Piping Specialties."

3.4 PIPING INSTALLATION

A. Drawings show the general arrangement, layout and location, of piping, appurtenances, etc., but do not show all required fittings and offsets that may be necessary to connect piping to equipment, etc., offset around obstructions, and to coordinate with other trades. Fabricate and install piping, appurtenances, etc., based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades, existing building conditions, etc., for space available and relative location of piping, appurtenances, etc. Pipe, appurtenances, etc., locations shown on drawings shall be altered by Contractor where required to avoid interference and clearance difficulties.

B. Provide chrome plated escutcheon plates for all piping penetrations through walls exposed to view.

C. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

D. Route piping in orderly manner and maintain gradient.

E. Install piping to conserve building space and not interfere with use of space.

F. Group piping whenever practical at common elevations.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

H. Provide clearance for installation of insulation and access to valves and fittings.

I. Slope water piping and arrange to drain at low points.

J. Establish elevations of buried piping outside the building to ensure not less than 2 feet of cover.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply two coats of galvanized paint to welding.

L. Mitered Fittings and Tapped Pipes: Mitered fittings and tapped pipes are not allowed. All changes in direction and pipe branches shall be accomplished by the use of fittings.

M. Pipe Routing: Pipes shall be run level (except as required for grading) plumb and parallel with the building structure unless otherwise indicated on the drawings.

N. Spacing Pipe: Maintain 4" minimum clearance between parallel runs of piping after insulating, space permitting.

O. Coring: On new construction, pre-cast sleeves in all masonry and concrete walls, floor and ceiling slab. For a limited number of openings, contractor may core drill openings in masonry and concrete walls and floor slabs where sleeves were inadvertently not installed as the wall or floor slab was constructed. Also, see pipe sleeve detail on the mechanical drawing. On existing construction, sleeve openings must be core drilled.

P. Grooved: Where specified herein, piping shall be grooved in accordance with ANSI/AWWA C-606, CSA B-242, and the manufacturers published specifications. Provide lubricant furnished or approved by the manufacturer. Lubricate the gasket exterior thoroughly (including lips).

Q. Install Schedule 40 steel sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 15 Section "Basic Mechanical Materials and Methods."

3.5 JOINT CONSTRUCTION

A. General: Joints shall be determined by the equipment connections or by the valve or fitting specified herein.

B. Threaded: All threads shall be National Pipe Thread. Apply a commercial grade compound to the male threads only. Ream cut ends and remove all burrs.

C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

D. Grooved Joints: Assemble joints with grooved-end-pipe or grooved-end-tube coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

E. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

3.6 HANGER AND SUPPORT INSTALLATION

A. Pipe hanger and support devices are specified in Division 15 Section "Hangers and Supports."

B. Install supports according to Division 15 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials. Flush water piping prior to placing in service.

3.8 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 150 psig. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.9 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

END OF SECTION 15140

SECTION 15181

HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes pipe and fitting materials, joining methods and piping specialties as described below:

1. Hot-water heating piping.
2. Makeup-water piping.
3. Blow down-drain piping.
4. Automatic air-vent piping.
5. Pressure relief valve-inlet and -outlet piping.
6. Automatic air vents
7. High capacity automatic air vents
8. Diaphragm type expansion tank
9. Tangential type air separators
10. Air purgers
11. Strainers
12. Flexible pipe connectors
13. Pressure compensating flow control valves
14. Calibrated venturi/ball valves
15. Backflow preventers
16. Water Pressure Reducing Valves
17. Tangential Particle Separators
18. Pressure relief valves
19. Manual air vents
20. Pre-insulated steel steam and condensate piping below grade.
21. Steam and steam condensate piping
22. Steam traps
23. Steam pressure reducing valves

1.3 SUBMITTALS

A. Product data for each of the following shall be submitted under provisions of Section 15050.

1. Hydronic piping material.
2. Air control devices.
3. Hydronic specialties.

B. Operation and Maintenance Data for Air Control Devices And Hydronic Specialties: Submit operation and maintenance data under provisions of Section 15051.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Contractor shall certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
3. Conform to applicable state labor regulations.

C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. All grooved joint couplings, fittings, valves and specialties shall be the product of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooving components.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Section 15050.

B. Store and protect products under provisions of Section 15050.

PART 2 - PRODUCTS

2.1 HOT WATER HEATING PIPING ABOVE GRADE

A. Steel Pipe: ASTM A53 or A120, Schedule 40 black. Fittings: ANSI/ASME B16.3, malleable iron, Class 125 or ASTM A234, Class 125 forged steel butt weld type or malleable iron grooved rate for 450 psi at 200°F. Joints: Screwed for pipe two inches and smaller ANSI/AWS D1.1, welded or roll-grooved for pipe two and one-half and larger. Field wrap all damaged pipe fittings with a double layer, half lapped, 10 mil polyethylene tape. On piping 2-1/2" and larger, the contractor has the option of using grooved couplings and grooved fittings.

B. Nipples: All thread nipples are prohibited. Nipples 1-1/2" and smaller in diameter and attached to larger pipes shall be Schedule 80 and shall be attached with the use of threadolets or weldolets.

C. Flanges: Provide flanged ends on 2-1/2" and larger piping at connection to all valves, piping specialties and equipment connections. Provide union at piping 2" and smaller.

D. Elbows: Long radius elbows shall be used except where space restrictions absolutely dictate the use of short radius type. Mitered piping elbows are prohibited.

E. Weldolets and Threadolets: Weldolets and Threadolets may be used for side outlet reducing tees only if the branch is more than two pipe sizes smaller than the main. Reducers and increasers in horizontal piping shall be eccentric type, installed with the tops level to facilitate air removal. Reducers and increasers in vertical piping shall be concentric type.

2.2 MAKE UP WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88 type 'L' hard drawn. Fitting: ANSI/ASME B16.9 pressure pattern wrought copper. Joints: ANSI/ASTM B32 Lead free solder, having a composition of 95.5% tin, 4% copper and 0.5% silver.

B. On piping 2" and larger, the Contractor has the option of using grooved couplings and grooved fittings as manufactured by Victaulic.

C. In lieu of manufactured copper tee fittings, the Contractor has the option of using mechanically formed tee connections. Mechanically formed tees shall conform to the following:

1. Mechanically extracted collars shall be formed in a continuous operation consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the tube wall. The collaring device shall be fully adjustable as to insure proper tolerance and complete uniformity of the joint.
2. The branch shall be notched to conform with the inner curve of the run tube and dimpled to insure penetration of the branch tube into the collar is of sufficient depth for brazing and that the branch tube does not obstruct the flow in the mainline tube. Dimples shall be in line with the run of the tube and visible through the braze. All joints shall be brazed with BCUP-2 braze. The method shall be provided by T-drill7.

2.3 RELIEF VALVE DISCHARGE AND DRAIN PIPING

A. Utilize same piping material as specified for the medium being discharged.

2.4 UNIONS, COUPLINGS AND JOINTS

A. Shouldered Pipe End Couplings: Ductile iron housing clamps to engage and lock, designed to permit some angular deflection, contraction and expansion; "C" shape composition sealing gasket; steel bolts, nuts, and washers; galvanized couplings for galvanized pipe, in accordance with ASTM A153.

B. Dielectric Connections:

1. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

2. Dielectric Unions: Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.
3. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
4. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

    a. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

5. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
6. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

C. Grooved Couplings: Where grooved piping is allowed herein, grooved piping couplings shall be installed in accordance with ANSI/AWWA C-606, CSA B-242, and the manufacturers published specifications. Approved manufacturers are Victaulic, Grinnell Mechanical Products, Anvil, or Gustin-Bacon. The housing shall be ductile iron conforming to ASTM A-536 or malleable iron conforming to ASTM A-47 described as follows:

1. Rigid Type Couplings: Housing cast with offsetting, angle-pattern bolt pads to provide rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9. Victaulic Style 07 or Victaulic Style 107.
2. Flexible Type Couplings: Use in locations where vibration attenuation and stress relief are required. Victaulic Style 77.
3. The coupling shall be pressure rated as listed below at 200°F:

    a. 4" and smaller: 500 psi
    b. 5" and larger: 450 psi

D. Unions: For pipe sizes 2 inches and under, unions shall be 150 psig malleable iron unions for threaded ferrous piping and shall be 150psig bronze with soldered joints for copper piping.

2.5 FLANGES

A. Raised face 150 lb. welding neck flanges with carbon steel bolts full size of bolt holes and hex nuts with washers. Install flanges in horizontal lines with bolt holes straddling vertical and horizontal pipe center lines. Install flanges in vertical lines with bolt holes straddling lines parallel to equipment center lines and building lines. Gaskets shall be 1/16" gray-black ring type compressed non-asbestos, ANSI B16.21.

B. Flat face 150 pound welded slip on flanges with carbon steel bolts full size of bolt holes and hex nut with washers with 1/8 inch red rubber full face gasket shall be used when connecting steel water piping to PVC piping flanges.

C. Flange Adapter for Grooved Piping: Ductile iron housing conforming to ASTM A536, with pressure responsive synthetic rubber gasket (grade to suit the intended service).

1. For Copper Tubing: For direct connection to ANSI Class 125 or 150 flanged components. Victaulic Style 641.
2. For AWWA Ductile Iron Pipe: For direct connection to ANSI Class 125 flanged components. Victaulic Style 341.
3. For IPS Steel Piping: For direct connection to ANSI Class 125 or 150 flanged components. Victaulic Style 741.

2.6 SOLDER

A. Solder shall be lead free having composition of minimum 94% tin, 4% to 5% copper and 0.4% to 0.2% silver or selenium. Solder shall have a minimum tensile strength of 6,900 psi at 70°F, melting temperature of between 410°F and 440°F maximum to protect valve seat material. Solder shall conform to ASTM B-32 and shall be applied in conformance with ASTM B-828. Flux shall conform to ASTM B-813. Solder shall be manufactured for the HVAC industry not circuit board industry. Solder shall be Taramet Sterling Lead Free as manufactured by Taracorp, Dutch Boy Silver as manufactured by Taracorp or Lenox Sterling Lead Free.

2.7 BRAZING ALLOY

A. Brazing alloy shall be copper and phosphorous with minimum 15% silver, minimum melting temperature of 1190°F. Brazing alloy shall meet AWS BcuP-5 classification.

2.8 AIR CONTROL DEVICES

A. Automatic Air Vents: Bronze or cast iron body with all brass internal part construction with ball check to prevent air re-entry. Suitable for pressures to 75 psig and temperatures to 240 degrees F. Provide 1/4" NPS discharge connection.

1. Hoffman: No. 79
2. American Tube: 706
3. Armstrong: 1-AV
4. Metraflex: Metravent
5. Flow Design: No. 1/4AA
6. Maid-O-Mist

B. "High Capacity" Automatic Air Vents: Cast iron or brass construction with stainless steel, brass, EPDM and silicone rubber internal components. Provide float action pilot operation for instant venting of air. Suitable for pressures to 150 psig and temperatures to 250 degrees F. High capacity type automatic air vents must have a published air removal capacity of 10 scfm at 15 psig. Provide 1/8" tapping for drain connector.

1. Bell & Gossett: No. 107
2. Amtrol: 720
3. Taco: 409
4. Wheatley: AR050
5. John Wood: JHAV-63-075

C. Diaphragm-Type Expansion Tanks: Vertical or horizontal (as indicated) partial acceptance diaphragm type tank with steel shell designed and constructed in accordance with ASME Section VIII. Bladder shall be fabricated from heavy duty butyl rubber, and shall separate air charge from system water to maintain required expansion capacity. Tank shall be ASME stamped for working pressure of 125 psig with the ASME "U" symbol stamped on the air separator or nameplate and maximum operating temperature of 240°F. Provide schraeder valve for charging purposes. Expansion tanks shall be manufactured by Taco, Armstrong, Amtrol, Thrush, Wood, Wheatley or Bell and Gossett.

D. Tangential-Type Air Separators: Combination tangential type air separator and system strainer. Non-tangential, in-line deceleration type air separators are not allowed. Units to have internal perforated stainless steel air collector tube to direct released air into the high capacity automatic air vent. A blow-down connection shall be provided for routine cleaning. Units shall be constructed in accordance with ASME and stamped for 125 lb. working pressure with the ASME "U" symbol stamped on the air separator or nameplate. Provide factory installed support brackets welded to shell. Air separators shall be manufactured by Bell and Gossett, Taco, Amtrol, Thrush, John Wood, Wheatley or Armstrong.

E. Air Purgers: Air purger shall operate on decreased velocity principle, with air collecting in top of scoop. In-line air purger shall be cast iron or steel construction with minimum 125 psi working pressure, complete with vent tapping and drain tapping, with flanged or threaded connections. Maximum pressure drop at scheduled flow shall be 4 feet pressure drop. Air purger shall be manufactured by Bell and Gossett, Armstrong, Amtrol, Taco or Thrush.

F. Manual Air Vents: Brass body, “Coin-operated” style, Knurled slotted handle, blowout proof needle style valve, side vent, 1/8" to 1/4" NPT. Provide extended neck on insulated piping. Vent shall be rated minimum 150 psig at 250˚F. Bell and Gossett Model 4V, Flow Design Model AV, or Griswold Model 738-01.

2.9 HYDRONIC PIPING SPECIALTIES

A. Strainers:

1. Y-Type, 2-1/2" and Smaller: Threaded or soldered connections, cast bronze, 200 psi WOG at 150°F. Basis of design is Watts 777.
2. Y-Type, 2-1/2" and Larger:

    a. Flanged connections, cast iron body, Class 125, 200 psi WOG at 150°F ASTM A-126 Class B. Basis of design is Watts 77F-D.
    b. Grooved connections, ductile iron body, 300 psi at 230°F, basis of design is Victaulic Style 732.

3. Basket Type: Flanged connections, removable bolted cover, cast iron body and cover. Provide machined seat for basket alignment. Basis of design is Watts 97FB-CIB.

4. Strainer Screens: On strainers serving devices with 1.5 gpm or less, provide 40 mesh wire screen strainer. On strainers upstream of plate and frame heat exchangers, provide 40 mesh wire strainer screen liner in addition to perforated screen. On all strainers greater than 1.5 gpm, provide a 20 mesh wire start-up screen liner. On strainers 2" to 5", provide 1/16" perforated screen. On strainers 6" and larger, provide 1/8" perforated screen. All screens shall be type 304 stainless steel.
5. Contractor shall remove start-up strainer liner after approximately 60 hours operating time, unless a different time is specified in "Pipe Flushing and Cleaning" paragraph. Install strainers with chamber facing down to prevent air binding of the housing. Install strainer so cover and screen are easily removable. Provide full size blow down ball valve with hose connection and cap on strainers 2-1/2" and larger. Blow down opening on cover shall be on bottom of cover.
6. Strainers shall be manufactured by Griswold, Anvil, Mueller, Hoffman, Metraflex, Keckley, Flow Design, Hydronic Components, Inc. (HCI), Victaulic or Wheatley equal to the basis of design Watts model specified herein. Strainers may not be field fabricated. Combination Y-strainer and ball valves shall be manufactured by Flow Design, Pro Hydronics, Nexus, Bell and Gossett, Griswold or Parts Service Inc.

B. Spherical Rubber Flexible Connectors:

1. Spherical connector for pump isolation shall be constructed of neoprene and nylon with bias ply tire cords, complete with steel plate flanges tapped or drilled to mate with 150 lb. flanges. Connectors shall be capable of controlling compression, elongation, lateral and angular movement. Provide flexible connector tie rods to prevent connector failure. Temperature range 20°F to 240°F. Braided steel or bronze flexible connectors shall not be allowed. Flexible pipe connectors shall be manufactured by Metraflex, Flex-hose, Keflex, Belmont, Garlock, Twin City Hose, Southeastern Hose or Wheatley.
2. A grooved pipe three flexible coupling arrangement will be allowed in lieu of spherical flex connectors at equipment hookups on pumps 10hp and smaller. This arrangement shall provide allowances for controlled pipe movement, expansion/contraction/deflection, absorbing noise and vibration, as well as movement from thermal changes and setting. Flexible couplings shall be Victaulic style 75, 77 or 791 and number shall be stamped on coupling to allow identification as a flexible coupling (as opposed to a rigid coupling). Couplings do not have to be in series, but shall be in close proximity to the device.

C. Flexible Couplings: Provide flexible coupling arrangements in noted sections of piping as indicated on the drawings. Coupling shall be Victaulic style 75, 77 or 791 and number shall be stamped on coupling to allow identification as a flexible coupling.

D. Pressure Compensating Flow Control Valves:

1. 1-1/2" and Smaller valves: 450 psi/200°F rated threaded ductile iron or forged brass body, removable flow cartridge, factory preset to maintain water flow at the GPM required by the drawings and/or the equipment manufacturer to within 5% accuracy over an operating pressure differential of at least 14 times the minimum required for control (2-32 PSID unless noted otherwise on the drawings.) Flow cartridge shall have brass body with stainless steel piston and stainless steel spring. All moving parts inside cartridge shall be stainless steel. Rubber or plastic is not allowed.

Provide units complete with pressure/temperature ports (Pete's Plugs) and metal tag denoting equipment number and gpm. On insulated piping systems over 1" thick, Pete's plugs shall be extended type to clear insulation (minimum length of 2-1/2"). On any insulated piping system, where integral shutoff valve is submitted, extended handle option shall be provided. Automatic flow control valve shall be Y-type to allow flow cartridge removal from the valve body without the use of special tools and without breaking the main piping. The internal wear surfaces of the valve cartridge must be electroless nickel or stainless steel. The internal flow cartridge shall be permanently marked with the GPM and spring range. Flow control valves that contain an integral shutoff valve will be allowed, but this integral valve will not be allowed as a substitute for the separate shutoff valve shown on the drawings, unless the combination valve has a published lifetime warranty by the manufacturer. Each flow control cartridge shall be factory flow tested and calibrated. Valve body size shall be, as a minimum, the size shown on the schedule on the drawings. Also, valve body size shall be provided such that flow rate is not greater than 90% of the maximum published flow rate. (For example, if manufacturer's maximum flow rate for the valve at specified operating differential pressure range is 12 gpm, the maximum allowable flow rate by this contract is 10.8 gpm.)

2. 2" and Larger valves: Shall be similar to above with 200 psi/250°F maximum temperature, flanged iron body, complete with pressure/temperature ports (Pete's Plugs) and metal tag denoting equipment number and gpm. Other requirements are similar to smaller valve specified above.
3. Manufacturers: The pressure compensating flow control valve or combination pressure compensating flow control valve and ball valve shall be manufactured by Griswold, Nexus, Tour & Anderson with bypass arrangement, Parts Service, Inc., Pro Hydronics, Hydronic Components, Inc. (HCI), Bell & Gossett, or Flow Design.
4. See Section 15051 for warranty information.

E. Calibrated Venturi/Ball Valve: Valve shall be ball valve with two access pressure ports (Pete's plugs) for direct gpm read out. Valve shall have a calibrated venturi with a minimum flow signal of two feet of head at the design flow with the valve in the wide open position. Venturi shall be a true venturi, with one static pressure tap at the inlet section and the second static pressure tap at the throat section, and a static regain recover section. The permanent pressure loss at design flow shall not exceed two feet of head in the wide open position. Orifice type measuring devices shall not be allowed. Provide submittal data for each valve showing permanent pressure drop and flow signal. The valve shall have a memory stop to allow complete shut-off and return to set position without losing the set point. On insulated piping systems over 1" thick, Pete's plugs shall be extended type to clear insulation (minimum length of 2-1/2"). On any insulated piping system extended handle option shall be provided. Venturi shall be precision machined brass and valve body shall be brass or bronze with blowout proof stem, teflon seats, brass stem and packing nut, and steel handle. Valves shall be factory leak tested at 100 psi air under water. Rated 400 psig at 250°F. Cataloged accuracy shall be 3% of full scale. The venturi/ball valve shall have inherent built in section of straight pipe required to achieve 3% full scale accuracy. Valve shall be manufactured by Flow Design, Nexus, Pro Hydronics, Bell & Gossett, Hydronic Components, Inc. (HCI), Griswold or Parts Service, Inc.

2.10 BACKFLOW PREVENTER

A. Reduced pressure zone principle: bronze body, ball valve test cocks, replaceable seats, with strainer, quarter-turn valves and manufacturer furnished air gap fitting. Watts series 909-S-QT or equal by Zurn or Wilkins.

B. Single Equipment Applications: Watts Series 9-D or equal by Zurn or Wilkins.

2.11 WATER PRESSURE REDUCING VALVES

A. Bronze body, nickel alloy seat, high temperature resisting diaphragm with stainless steel perforated strainer screen and built-in bypass check valve feature to relieve thermal expansion pressure. Adjusting screw and cage screws shall be corrosion resistant.

B. Provide pressure gauge on both sides of valve.

C. For locations or equipment having pressure requirements of 25-75 psi provide Watts 223SB with number 146 spring.

D. For make-up water station and any other equipment having a pressure requirement for 10-35 psi, provide Watts 223SBLP with number 69 spring.

E. Equals by TACO, B & G, Wilkins or CASE-ACME with appropriate springs are acceptable.

2.12 TANGENTIAL PARTICLE SEPARATOR

A. Separator: Tangential separator designed to force particles to move in a downward spiral motion into a dirt holding chamber, with clean liquid rising through center vortex. Separator shall remove all solids 50 microns in size and all particles heavier than 1.2 specific gravity. Separator shall have threaded or flanged connections as scheduled and shall be ASME certified for 150 psig working pressure. Unit shall be constructed of 10 gauge carbon steel with welded steel support legs. Unit shall be hydrostatically tested at the factory. Unit shall have 1/4" NPT female for pressure gauge at outlet and shall have purge outlet on bottom with manual valve. Unit shall have no moving parts and shall have a five year warranty.

B. Automatic Blow Down Controller: Panel shall be NEMA 1, lockable, designed for 120 VAC power input. Panel shall be provided with solid state automatic purge controller (timer). Controller shall be capable of purging as often as every 30 minutes or as long as 36 hours. Purge duration shall range between 4 and 36 seconds. Controller shall be equipped with "purge duration" setpoint adjustment knob, "cycle timer" adjustment knob, power on-off switch, and reset button. Unit shall include 24 VAC transformer, and open/close factory provided full size solenoid valve.

C. Manufacturers: Tangential particle separator and controller shall be manufactured by Griswold, Process Efficiency, Lakos or prior approved equal.

2.13 PRESSURE RELIEF VALVES

A. Bronze or brass body for protection of pressure, with pressure setting as indicated on drawings. Maximum temperature of 250°F. Pressure relief valve shall be ASME Section IV certified.

B. Manufacturer: Watts Model 174A, Model 790 or 1170 by Bell & Gossett or equal by Zurn.

2.14 PRE-INSULATED STEEL STEAM AND CONDENSATE PIPING BELOW GRADE

A. Pre-insulated steam and condensate piping system:

B. Carrier Piping: Carrier piping shall be ASTM A120 for pipe 4" and smaller, schedule 80, black. Joints shall be welded.

C. Insulation: Insulation shall be rigid 90 to 95% closed cell polyurethane with 1.9 to 2.1 pounds per cubic foot density and a coefficient of thermal conductivity (K) of 0.14 BTU/hr. (sq. ft.) (F/in) at 73 degrees F.

D. Jacket: Jacket shall be fiberglass (FRP) with a minimum thickness of 0.55" and directly applied on insulating foam.

E. Fittings: Fitting shall be butt weld steel fittings. Insulate per manufacturer's recommendation.

F. Installation: contractor shall provide each worker installing this piping with a minimum of 4 hours training from a factory trained and authorized service instructor. The factory authorized service representative shall inspect the installation and pressure test and provide written certification on the manufacturer's letterhead that the installation complies with the manufacturer's written installation instructions.

G. Manufacturers: Piping system shall be manufactured by Perma-Pipe, Urecon, Thermacor or Rovanco.

2.15 STEAM AND STEAM CONDENSATE AND STEAM VENT PIPING

A. Steel Pipe: ASTM A53, Grade B for pipe 5" and larger or ASTM A120 for pipe 4" and smaller, Schedule 80, black. The ASTM number and schedule shall be stamped on each length of pipe. Screwed Fittings: ANSI/ASME B16.3, malleable iron, Class 125, ASTM A126; Welded Fittings: Class 125, forged steel butt weld type, ASTM A234. All Joints: Screwed for pipe two inches and smaller, national pipe thread, reamed and cleared of burrs; ANSI/AWS D1.1 welded or flanged for pipe two and one-half and larger per ANSI B31-3 for pressure piping.

B. Steam Flanges: Steam flanges shall be 300 pound weld neck flanges with carbon steel bolts, full size of bolt holes, and hex nuts with washers. Gaskets shall meet ANSI B16.21 Standards.

C. Steam Fittings: Steam fittings and piping components shall be Schedule 80 and rated for 300 pound working pressure.

D. Steam Strainers: Strainers shall be rated for 250 pound minimum working pressure. Provide isolation valves and unions for each strainer. The strainer shall be accessible for periodic removal of debris. Screen shall be stainless steel Type 304, 20 mesh. Body to be cast iron.

2.16 STEAM PRESSURE REDUCING VALVE

A. This valve shall be suitable for reducing the indicated flow rate of steam from 150 psi to required pressure of process equipment. Contractor shall verify operating pressure of equipment. . Valve shall have NPT or flanged connections, 250 psi cast iron body, stainless steel seats, springs, stems and guides. Provide and pipe downstream pressure sensing pipe with tap a minimum of 10 diameters downstream of valve. Spirax/Sarco Model No. 25 or ITT Hoffman.

2.17 STEAM TRAPS

A. Float and thermostatic steam traps shall be of the mechanical lever ball float type having an SG ductile iron body with horizontal in line screwed connections and shall incorporate a balanced pressure thermostatic air vent. Valve mechanism shall be stainless steel and attached to a removable cover for easy maintenance. Cover shall be 180 degrees reversible to permit flow in either direction. See drawings for capacities.

B. Thermodynamic steam traps shall be all stainless steel thermodynamic disc type with connections on a common center line which can be installed in position. Integral seat design with hardened disc and seating surfaces.

C. Approved manufacturers: Spirax Sarco, Armstrong, and ITT Hoffman.

PART 3 - EXECUTION

3.1 PIPING INSTALLATIONS

A. Drawings show the general arrangement, layout and location, of piping, appurtenances, etc., but do not show all required fittings and offsets that may be necessary to connect piping to equipment, etc., offset around obstructions, and to coordinate with other trades. Fabricate and install piping, appurtenances, etc., based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades, existing building conditions, etc., for space available and relative location of piping, appurtenances, etc. Pipe, appurtenances, etc., locations shown on drawings shall be altered by Contractor where required to avoid interference and clearance difficulties.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise. Route piping in an orderly manner.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel and lay in light fixture removal. Install piping to conserve space and not interfere with use of space.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other at common elevations, spaced to permit applying insulation and servicing of valves. Maintain four-inch minimum clearance between parallel runs of piping after insulating, space permitting.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Establish inverts and install piping at a uniform grade of 0.2 percent upward in direction of flow for non-gravity systems.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. In mechanical corridors, branch connections shall be out of the main at an angle 45 degrees below horizontal. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to Division 15 Section "Valves."

Q. Install unions or grooved joint couplings in piping**,** NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

S. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blow off connection for strainers smaller than NPS 2.

T. Identify piping as specified in Division 15 Section "Mechanical Identification."

U. Provide chrome plated escutcheon plates for all piping penetrations through walls exposed to view.

V. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

W. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

X. Mitered Fittings and Tapped Pipes: Mitered fittings and tapped pipes are not allowed. All changes in direction and pipe branches shall be accomplished by the use of fittings.

Y. Where flanged connections are provided to connect butterfly valves to other flanged piping components, the contractor shall provide spool pieces as necessary to allow the disc to extend to the fully open position.

3.2 STEAM PIPING INSTALLATION

A. The steam piping shall be installed, tested and insulated in accordance to contract documents as a minimum and industry standards. The steam piping system shall be purged from air and hydrostatically tested to 200 PSIG and shall hold said test pressure for a period of 4 hours without a drop in pressure.

3.3 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 15 Section "Hangers and Supports." Comply with the following requirements for maximum spacing of supports.

B. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1/2 and NPS 3/4: Maximum span, 6 feet; minimum rod size, 3/8 inch.
2. NPS 1 and NPS 1-1/4: Maximum span, 6 feet; minimum rod size, 3/8 inch.
3. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. NPS 2-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
6. NPS 3: Maximum span, 10 feet; minimum rod size, 1/2 inch.
7. NPS 4 and NPS 5: Maximum span, 10 feet; minimum rod size, 5/8 inch

C. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 3/8 inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, 3/8 inch.
3. NPS 1-1/4: Maximum span, 6 feet; minimum rod size, 3/8 inch.
4. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.

D. Install a hanger within 12-inches of each horizontal elbow.

3.4 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems. Joints shall be determined by the equipment connections or by the valve or fitting specified herein.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
3. Use threaded pipe only in accessible locations.

G. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Grooved joint piping systems shall be installed in accordance with the manufacturer’s guidelines and recommendations. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to grove. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings. Grooved coupling manufacturers factory trained field representative shall provide on site training for contractor’s field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representatives shall periodically inspect the product installation. Contractor shall remove and repair any improperly installed products.

1. Use grooved couplings only in accessible locations.
2. Provide lubricant furnished or approved by the manufacturer. Lubricate the gasket exterior thoroughly, including lips.
3. Gaskets shall be EPDM having a temperature range of -30°F to 230°F.

3.5 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install automatic air vents at all high points of system piping and elsewhere as required for air venting and as shown on the drawings.

C. Install tangential air separator upstream of pump suction. Install blow down piping with full-port ball valve; extend full size to nearest floor drain or cap as shown on drawings.

D. Vent and purge air from hydronic system, and ensure expansion tank is properly charged with air to suit system Project requirements.

3.6 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Division 15 Section "Meters and Gages."

3.7 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Coordinate pressure tests of piping with phasing as described in phasing plan.
3. Flush hydronic piping systems as described in paragraph “Pipe Flushing and Cleaning”.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure of 150 psig. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks. Test pressure shall be maintained for four hours. There shall be no drop in pressure during the test. All copper pipes shall have the joints struck during the test.

6. Piping systems shall be subjected to constant inspection and final approval of the Owner, Engineer and Code Authorities having jurisdiction. Contact Architect/Engineer and all code authorities 48 hours before making any pressure tests. Tests, in addition to those included in this section required to show compliance, shall be performed as directed at no additional cost.
7. Prepare written report of testing.

C. Contractor shall, at the completion of the project, bleed all air out of the piping system using manual and automatic air vents. This shall occur, at a minimum, at all locations where air is suspected to have accumulated, at all high spots, and where specifically shown.

D. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

E. Training: For grooved piping, a factory trained representative (direct employee) shall provide on-site training for contractor’s field personnel in the use of grooving tools, application of groove and product installation.

F. Application: For grooved piping, a factory authorized representative shall periodically visit the job site and review installation. Contractor shall remove and replace any improperly installed products.

3.8 EXCAVATION AND BACKFILL (ALL PIPING)

A. Excavate trenches to the elevation required by the pipe. Trench shall not be undercut unless the trench bottom is in rock or hard strata, cinders, organic soils or injurious materials. Under cut shall be a minimum of 6" below the invert of the piping and shall be refilled with inorganic soil or sand tamped in place.

B. Contractor shall furnish all labor, materials, and equipment to keep the excavation free of water either from surface sources or from underground sources or from both. When underground water is encountered, undercut the trench 6" and backfill with graded aggregate base type C (crush and run gravel). The selections of the equipment and method of the removal of the water shall be the responsibility of the Contractor. The Contractor shall be and is responsible for all damage incurred in handling water conditions. The present provision supersedes and replaces all other provisions relating to the removal of water from the site.

C. After piping has been tested, inspected and approved, trenches shall be backfilled to the first 12 inches over the pipe in 4 inch lifts and hand tamped.

D. After the first 12 inches, lifts shall not exceed 8 inches. The backfill in all trenches shall be compacted to 95% of the maximum dry density determined by the standard Proctor Compaction Test (ASTD D 698). Field density shall be taken at the rate of 1 for each 50 feet of trench for each 2 feet of fill. Cost of test shall be borne by the contractor.

3.9 PAINTING

A. All bare steel piping exposed to view provided under this section of specifications, shall be cleaned and painted under the Architectural Painting Section of the specifications. Also, all exterior piping and piping in the mechanical room shall be painted in accordance with these requirements.

3.10 WATER SYSTEM TREATMENT

A. Chemical Treatment: The original company which provided the chemical treatment for the original building shall be hired under this Contract to add chemical treatment to the expanded piping system in accordance with the original specification. This shall be a one time treatment which is not required to be repeated during the first year of system operation, provided the entire expanded piping system is brought to the proper level of treatment by this initial treatment.

END OF SECTION 15181

SECTION 15185

HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. In-Line Centrifugal Pumps
2. Base Mounted End Suction Centrifugal Pumps
3. Pump Specialty Fittings

    a. Suction Diffusers
    b. Triple Duty Valves

1.3 SUBMITTALS

A. Product Data: Include certified performance curves and rated capacities, operating characteristics, dimensions, furnished specialties, final impeller dimensions, motor efficiency and insulation winding classification, and accessories for each type of product indicated. Indicate pump's specified operating point on curves. For all pumps that are used in variable speed applications, insure motor is submitted showing Class F winding insulation, and insure coupling is submitted with a statement by the manufacturer that is rated for variable speed duty. Submit data on pump specialty fittings. Submit under provisions of Section 15050.

B. Operation and Maintenance Data: For pumps, submit operation and maintenance data under provisions of Section 15051.

C. Minimum Flow Data: Pump manufacturer shall indicate the minimum allowable flow rate (GPM) for loop water pumps in the submittal so the control Contractor can maintain this flow rate when programming VFD.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hydronic pumps through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of hydronic pumps and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store pumps in dry location. Retain protective covers for flanges and protective coatings during storage. Protect bearings and couplings against damage from sand, grit, and other foreign matter. Comply with pump manufacturer's written rigging instructions.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete and reinforcement requirements are specified in Section 15060 – Hangers and Supports.

PART 2 - PRODUCTS

2.1 BASE MOUNTED END SUCTION CENTRIFUGAL PUMPS

A. Pumps shall be single stage end suction, based mounted, flexible coupled design of Class 30 cast iron volute with integrally cast pedestal support foot and bronze fitted construction. Internal parts requiring service shall be serviceable without disturbing motor, and volute shall be foot mounted to allow servicing of the impeller and bearing assembly without disturbing piping connections. Pump shall be rated for a minimum of 175 psi working pressure. Impeller shall be cast bronze or brass enclosed type, dynamically balanced, keyed to the shaft and secured by a locking cap screw. The liquid cavity shall be sealed at the pump by an internally flushed single mechanical seal with carbon seal ring and ceramic seal seat suitable for continuous operation at 225°F. Pumps shall be 1750 rpm, with drip proof motor direct connected to the pump through a center drop out design flexible coupling complete with OSHA approved coupling guard. Pumps intended for variable speed duty shall be provided with an EPDM material or other material specifically designed for variable speed applications. Pump and motor shall be factory aligned and shall be realigned by contractor after installation. Motors for pumps controlled by variable frequency drives shall be premium efficiency or inverter duty rated. See Section 15010 for motor efficiency required. The motor shall be securely bolted to a steel saddle of not less than 3/16" thickness. Base plate shall be of structural steel or fabricated steel channel with fully enclosed sides and ends, and securely welded cross members. Rolled steel and “C” channel base plates are not allowed. The minimum base plate stiffness shall conform to ANSI/HI 1.34-1997 for “Horizontal Base Plate Design” standards. Grouting area shall be fully opened. Each pump shall be factory tested per Hydraulic Institute Standards and painted with machinery enamel prior to shipment. Volute shall have vents at high points and drain plugs at low points, and gauge tappings on suction and discharge flanges.

B. Pumps shall be manufactured by Bell & Gossett, Taco, Armstrong, Paco, Mepco or Aurora.

2.2 IN-LINE CENTRIFUGAL PUMPS

A. The pumps shall be the in-line, close-coupled, single stage type of Class 30 cast iron body with bronze fitted construction with 175 psi working pressure rating. Provide gauge tappings on flanges and drain and vent parts. All internal components requiring service shall be accessible without disturbing pipe connections. A standard mechanical seal with ceramic seat shall be used. The impeller shall be the enclosed type, dynamically balanced at the factory and keyed (with locking screw) to the shaft with flexible coupling at the motor shaft.

B. Pumps shall be manufactured by Bell & Gossett, Taco, Armstrong, Paco, Mepco or Aurora.

2.3 PUMP SPECIALTY FITTINGS

A. Suction Diffusers

1. Flanged angle type body with inlet vanes and combination diffuser/strainer/orifice cylinder with 3/16" diameter openings for pump protection. Inlet vanes shall be constructed of stainless steel on open (cooling tower) systems. Provide a removable, permanent magnet in the flow stream and disposable fine mesh strainer to be removed after system start-up. Provide adjustable support foot to carry weight of the piping. Provide at suction inlet to each base-mounted pump. Provide cast iron body rated for 175 psig. Provide orifice cylinder with length of flow straightening vanes equal to 2-1/2 times the diameter of the system pump suction connection. Provide removable cast iron cover with EPDM reusable O-ring seal. Suction diffusers shall be designed for rear strainer pullout; bottom strainer pullout will not be allowed. Suction diffusers shall be manufactured by Bell & Gossett, Thrush, Armstrong, Mueller, Amtrol, Wheatley, or Taco.
2. Grooved end with inlet vanes and combination diffuser-strainer-orifice cylinder shall be of type 304 stainless steel with 3/16" diameter holes. Start-up pre-filter shall be bronze 16 mesh screen. Maximum working pressure of 300 psi, a 1-1/4" pipe support base, drain plug and gauge taps shall be provided. Gasket grade shall be EPDM for temperature range -30°F to +230°F continuous service. Basis of design is Victaulic style 731-G. Approved equal model by Grinnell Mechanical Products, Anvil or Gustin-Bacon will be allowed.

B. Triple-Duty Valves

1. 125 psi ANSI flanged straight type or angle type body as indicated with combination non-slam type check valve/isolating valve/balancing valve. Provide external operating stem, with memory stop for balancing purposes. Provide cast iron body, brass seat, bronze disc with EPDM seat, brass or stainless steel stem, stainless steel spring, and brass read out valves. Provide calibrated nameplate and position indicator to show from 0 to 100 percent open in 10 percent increments. Valves shall be rated at 175 psig maximum working pressure at 250°K. CV rating shall be provided at every 10% increment. Triple-duty valves shall be manufactured by Bell & Gossett, Armstrong, Mueller, Amtrol, Taco or Wheatley.

2. Grooved end triple service valves shall consist of Victaulic Series 300 Master-Seal butterfly valve in conjunction with series 779 venturi check valve. Triple service valves shall provide shut-off, throttling and balancing with reverse flow protection at 300 psi working pressure. Approved equal model by Grinnell Mechanical Products, Anvil or Gustin-Bacon will be allowed.

PART 3 - EXECUTION

3.1 PUMP INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories. Provide no less than minimum as recommended by the manufacturer.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Install continuous-thread hanger rods and vibration isolators of sufficient size to support in-line pump weight. Install pumps with motor and pump shafts vertical. Hanger and support materials and vibration isolators are specified in Division 15 Section "Hangers and Supports."

E. Lubricate pumps before start up.

F. Set base-mounted pumps on concrete foundation. Disconnect coupling before setting. Do not reconnect couplings until alignment procedure is complete.

G. Base mounted pumps shall be bolted to concrete base and shimmed to level in both directions. Couplings shall be aligned. Piping shall be inspected for alignment prior to bolting to pumps.

H. Pump base, coupling, etc. for outdoor mounted pumps shall be painted with a weatherproof enamel specifically designed for outdoor usage. Motor shall be totally enclosed.

3.2 ALIGNMENT

A. Align pump and motor shafts and piping connections after setting on foundation, grout has been set and foundation bolts have been tightened, and piping connections have been made. Piping shall be inspected for alignment prior to bolting to pumps.

B. Comply with pump and coupling manufacturers' written instructions for alignment.

C. Adjust pump and motor shafts for angular and offset alignment by methods specified in HI 1.1-1.5, "Centrifugal Pumps for Nomenclature, Definitions, Application and Operation."

D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill base plate with non-shrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.3 CONNECTIONS

A. Install piping adjacent to machine to allow service and maintenance.

B. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles. Decrease from line size to pump size with reducers.

C. Install triple-duty valve on discharge side of pumps. Maintain minimum 5 pipe diameter between discharge of pump and triple duty valve.

D. Install suction diffuser and shutoff valve on suction side of base mounted end suction pumps. Provide temporary start-up strainer at suction diffuser and remove after start-up service and replace with standard screen.

E. Install line size (not pump connection size) flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.

F. Install pressure gages on pump suction and discharge, at integral pressure-gage tapping.

END OF SECTION 15185

SECTION 15710

HYDRONIC AND STEAM HEAT EXCHANGERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes shell-and-tube heat exchangers.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories. Product data shall be submitted under the provisions of Section 15050.

B. Operation and Maintenance Data: For heat exchangers, submit operation and maintenance data under provisions of Section 15051.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, performance, and dimensional requirements of heat exchangers and are based on the specific equipment indicated. Refer to Division 1 Section "Product Requirements."

B. ASME Compliance: Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

C. Registration: Fabricate and label shell-and-tube heat exchangers to comply with the Tubular Exchanger Manufacturers Association's standards.

D. Provide all accessories (e.g. guards, covers) to comply with applicable OSHA requirements.

PART 2 - PRODUCTS

2.1 SHELL AND TUBE HEAT EXCHANGER (STEAM TO HOT WATER)

A. General: ASME stamped shell and tube type heat exchanger designed to provide heating hot water using steam as the heating medium. Tubes shall be U-bend type, fabricated from 3/4" O.D. copper, pressure tested to 300 PSIG at 375°F. Tube bundle shall be removable, and provided with steel tube supports. Heating hot water shall be conveyed through tubes. Shell shall be fabricated from steel, pressure tested to 150° PSIG at 375°F. Steam shall be

conveyed through shell. Cast iron head shall be bolted to shell. Steam connection to shell shall be flanged and water supply and return connections to head shall be threaded or flanged. Steam condensate connections to shell shall be threaded or flanged. Provide anodic protection as recommended by the manufacturer.

B. Control: Provide a self powered steam control valve furnished by the shell and tube heat exchanger manufacturer. The hot water supply temperature shall be maintained at 140°.

C. Manufacturers: Steam to water heat exchanger shall be manufactured by Bell and Gosset, Thrugh, Armstrong, or Taco.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance of heat exchangers.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 HEAT-EXCHANGER INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. For plate and frame heat exchangers, install to permit removal of plates with minimum disturbance to installed equipment and piping. Install OSHA splash guard.

C. For shell and tube heat exchangers, support heat exchangers on welded steel pipe and angle floor stand anchored to concrete pad. Pitch shell to completely drain.

D. Install minimum 3/4" hose bibb (drain valves) with cap on bottom of lower pipe connections (2 each). Provide pressure gauges with shut-off cocks and thermometers in thermometer wells on all pipe connections.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Maintain manufacturer's required clearances for service and maintenance. As a minimum, provide 1.5 times plate width on one side for plate removal. Install piping connections to allow service and maintenance of heat exchangers.

C. Install shutoff valves at heat-exchanger inlet and outlet connections.

D. Install relief valves on shell and tube heat-exchanger heated-fluid connection and install pipe relief valves, full size of valve connection, to floor drain.

E. Install vacuum breaker at heat-exchanger steam inlet connection.

F. Install hose end valve to drain shell.

3.4 FIELD QUALITY CONTROL FOR SHELL AND TUBE HEAT EXCHAGER

A. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 CLEANING

A. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.6 START-UP STRAINERS

A. To prevent any debris from entering the plate and frame heat exchangers, fine mesh strainer media shall be provided at each Y-strainer at the heat exchanger inlet piping connections. These shall be cleaned frequently during start-up and after piping system is completely clean, start-up strainers shall be removed and replaced with piping specified mesh media.

END OF SECTION 15710

SECTION 15900

HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for equipment not supplied with factory-wired controls.

1.3 WORK INCLUDED

A. Complete control system for all heating, ventilating and air conditioning (HVAC) systems and exhaust systems including all integral and field mounted devices and control wiring. All control components shall be provided under this section of the specifications unless specifically provided elsewhere. A complete and fully operational control system shall be provided for all mechanical systems furnished under Division 15 to achieve the sequence of control specified: (1) herein (2) in other specification section or (3) as required to achieve proper operation of the equipment.

B. This system shall include all devices specified herein and shall include, but is not limited to; main DDC panels, standalone DDC controllers, software, graphics package, temperature sensors, relays, switches, contactors, control valves, transformers, etc.

C. This project includes maintaining the operation and control functions of many existing to remain pieces of HVAC equipment.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 15050 to the Owner and Architect/Engineer.

B. Each submittal shall contain the following information, as appropriate based on this particular project.

1. Single line schematics and flow diagrams showing the location of all control devices.
2. Points list for each DDC controller with input/output schedule.
3. Vender’s own written description for each sequence of operation.
4. Detailed bill of material for each panel.
5. Control valve schedule
6. Catalog cut sheets for all equipment used, including but not limited to: sensors, thermostats, actuators, etc.
7. Operator work station data and DDC panel data.

8. Submittal drawing index sheet with control system legend.

C. Controls contractor shall not order material or begin field installation until receiving approved submittals.

D. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and terminal to terminal control wiring, clearly indicating factory-installed and field-installed wiring associated with all equipment. Wiring diagrams shall show all point-to-point wiring connections between all components of the control system. **No devices, conduit or wiring shall be installed until Contractor has received approved shop drawings from the Architect/Engineer.**

E. Field quality-control test reports.

F. Operation and Maintenance Data: For HVAC instrumentation and control system, submit under the provisions of Section 15051

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with ASHRAE 135 for DDC system components.

D. Complete control system and submittal data for this system shall be prepared and provided by a factory authorized representative of the Control System Manufacturer with a minimum of five (5) years experience in control systems of similar size and complexity. The control system manufacturer must be able to demonstrate 5 similar projects with control systems operating successfully in the field for a minimum of five years.

E. The control contractor shall be a factory authorized branch office that is regularly engaged in the engineering, programming, installation and service of the control systems of similar size and complexity. The controls contractor shall have a local branch office with a 100 mile radius of the job site. Emergency service shall be available on a 24 hour, seven day a week basis.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.

B. System Software: Update to latest version of software at Project completion.

1.7 COORDINATION

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

1.8 WARRANTY

A. See Section 15051 for warranty information.

B. Emergency Service: The controls contractor shall restore the control system to proper operating condition within three calendar days after receiving a request for service.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Since Georgia College and State University has a campus-wide Siemens energy management and control system, the Contractor shall provide Siemens controls (no equal) as the sole manufacturer and installer of the control system for all work specified herein in Section 15900. These controls, including field installed microprocessors at each piece of HVAC equipment.

2.2 WIRING

A. All control wiring (including but not limited to control, interlock, sensor, thermostat, etc.) shall be provided under this section of these specifications. If 120 volt AC power for control devices is required and if Division 16 electrical drawings do not indicate 120 volt AC is provided to control devices, the control contractor is responsible for providing 120 volt AC as specified herein.

2.3 CONTROL COMPONENTS AND THEIR FUNCTION

A. Cabinets: Provide and install control cabinets constructed of heavy gauge steel or aluminum and consisting of a one piece rectangular or square ring, a sub-panel and a door with continuous hinge, and quick turn latch with keyed lock. Unless otherwise specified, all controllers, and other equipment furnished as part of the control system which are not required to be mounted on mechanical equipment shall be cabinet mounted. All wiring connections shall be made inside the cabinet. All electrical devices shall be wired to a numbered terminal strip. No field wiring shall be required within the cabinet except to the terminal strip.

B. Conduit and Raceway: Provide and install under this section.

1. Refer to Division 16 - Electrical for material requirements for conduit and flexible conduit. Conduit sleeves with bushing shall be provided at all control wiring penetrations through walls.
2. Outlet Boxes: Refer to Division 16. Provide and install under this section.

C. Conductors:

1. 50 to 600 volts: Refer to Section Division 16 for requirements.

2. Below 50 volts: Minimum size for individual conductors is AWG. No. 18. Minimum conductor sizes for multiconductor cables is AWG No. 22. Provide shielded cable as required to avoid EMI where conduits natural shielding effect is insufficient. Conductors shall be sized within acceptable voltage drop parameters.
3. Plenum Rated Cable: Plenum rated cable with flame spread of 25 or less and smoke development of 50 or less as tested by ASTM-E84.
4. Conductor Insulation: "TFFN", unless noted otherwise.
5. Taps and Joints: Mechanically and electrically sound.
6. Tape: Per Division 16. Provide and install under this section.
7. Lacing: Per Division 16. Provide and install under this section.
8. Lubricants: Per Division 16. Provide and install under this section.
9. Color Code: All low voltage control conductors shall be color coded by factory or provided with numbered ends.

D. Contactors and Disconnects:

1. All contactors for equipment specified in Division 15 shall be provided under this section of the specifications unless explicitly shown furnished by Electrical on the Electrical Drawings. Provide herein all relays and contactors necessary for the proper operation of all Division 15 equipment.
2. All electrical disconnects for equipment specified in Division 15 shall be provided under this section of the specifications unless explicitly shown furnished by Electrical on the Electrical Drawings.
3. Control Relays and Contactors: Relays for control purposes shall be the plug-in type with plastic enclosure surrounding the relay with contacts rated for a minimum of 110VAC and 24VDC. Relay shall operate properly over -25°C to 55°C ambient. Relay shall be UL recognized. Pick up voltage shall be a maximum of 80% of nominal and drop off voltage shall be a maximum of 30% of nominal. Contact rating, in-rush current, number of poles, coil voltage, etc. shall be appropriate for the application. Provide neon or LED "ON" indicator lamp.

E. HVAC Shutdown Relay: An HVAC shutdown relay shall be provided by Division 16 and shall be located near the DDC panel. Certain HVAC equipment shall be wired through this “HVAC Shutdown Relay” to achieve the control sequence specified herein. All noted equipment in Part 3 “Execution” shall shutdown in the event of closure of this HVAC shutdown relay which is activated by the main fire alarm panel.

F. Control Transformer: Provide transformers at all equipment as necessary to power control system. Provide at each piece of equipment with a field mounted DDC controller a field mounted 24V control transformer adequately sized for the DDC controller and other controls required for proper unit operation. Transformers shall be protected with in-line fuses on both the primary and secondary sides in accordance with Table 450.3(B) of the National Electric Code, unless the following primary current conditions apply. Transformers with a primary current less than 2 amperes shall be permitted to be fused on the primary side only provided the fuses do not exceed 300% of the transformer’s rated primary current. Transformers with a primary current less than 9 amperes shall be permitted to be fuse protected on the primary side only provided the fuses do not exceed

167% of the transformer's rated primary current. If control contractor intends to utilize any on board transformer provided by the HVAC equipment manufacturer, he shall provide signed statement from the equipment manufacturer indicating the allowable additional "VA" load that is available for additional devices.

G. Water Control Valves: Water control valves shall be properly sized for the application with a minimum valve authority (beta or B) for modulating valves greater than or equal to 0.50. Valve authority is defined as pressure drop across fully open control valve divided by the pressure drop of the entire coil circuit. The pressure drop across the entire coil circuit includes the fully open control valve pressure drop, the coil pressure drop, and all coil piping accessory components pressure drops, including strainers, elbows, tees and shutoff valves. Coil circuit is defined as the components between supply shut off valves and return shut off valve. Controls contractor shall verify approved coil pressure drops at scheduled gpm, and calculate beta, and list beta in submittal. Controls contractor may use two feet (2') head as estimated pressure drop of coil piping accessory components in lieu of detailed pressure drop takeoff, if desired. Valves for isolation (not modulating control) duty shall be line sized. In no event shall valves be more than two pipe sizes smaller than their connecting pipe size (line size). For each hydronic system, valves shall operate (open, close) against a differential pressure equal to 120% of the maximum pressure capable of being generated by the particular pump the Contractor chooses to furnish. Valves shall have minimum 125 psi rating. Valves shall be pneumatic, electronic spring or reversible motor return as scheduled on the drawings capable of receiving an input signal, suitable for open/close or modulating control as indicated on the drawings and designed to accept the appropriate actuator. Valve components shall be suitable for temperature range valve will experience. Valves shall be 2-way or 3-way as indicated on the drawings, brass or cast iron body, and designed specifically for its application. Flow characteristics of hot water valves and chilled water valves shall be equal percentage type. Provide stainless steel trim or bronze trim, as required, to achieve maximum differential pressure rating. Valve schedule Contractor submits shall be arranged as follows:

1. Valve Tag #: (1, 2, 3, etc.)
2. Equipment Served: (AHU-1, FCU-1, etc.)
3. Service: (Heating, Cooling, etc.)
4. Fail Position: (Bypass Coil)
5. Valve Model No.:
6. Size: (1/4-inch, 1/2-inch, etc.)
7. CV
8. Valve Authority (Beta)
9. Approved Coil Pressure Drops
10. Capacity Gpm:
11. Differential Pressure Rating, PSI:
12. Valve Pattern: (3-way, 2-way, etc.)
13. Pressure Drop At Rated Flow, PSI:
14. Flow Control: (2-position, Modulating, etc.)
15. Actuator Type: (24 volt, 120 volt, etc.)
16. Required Differential Rating, PSI: (1.2 x maximum pump D.P.)

H. Steam Control Valve: Steam control valves shall be properly sized for the application with a maximum 2 psi drop. Two-position steam valves shall be line sized.

I. Hydronic Differential Pressure Switch: Differential pressure switch shall be used to sense differential pressure across hydronic devices, in order to verify flow or to prove pump status. Switch shall be snap acting SPDT with 10 million cycle mechanical contact life. System operating pressure shall be 0 to 150 psig. Switch's setpoint shall be adjustable externally. Enclosure shall be NEMA 4.

2.4 DIRECT DIGITAL CONTROL (DDC) SYSTEM GENERAL PRODUCT DESCRIPTION

A. General: Control contractor shall provide a complete and fully distributed DDC control system for control and monitoring of the HVAC systems. The DDC system shall perform the sequence of operation specified herein. The DDC architecture shall consist of a main DDC panel, application specific controllers (ASCs), general purpose controllers, local area network (LAN) wiring, sensors and all other DDC components necessary for the sequence of control and as required by Owner.

B. Host Computer Operator Station Software:

1. Provide a complete graphics package to be installed in the existing host computer which would allow an untrained operator to fully configure, change, program, etc., all control parameters by use of real time graphical representations of the entire HVAC/control system by means of a mouse with minimal (if any) keystrokes. When the user "clicks" through a series of ever increasingly detailed floor plans and graphical equipment/control representations, he will be able to obtain individual room/equipment graphics to change all setpoints, schedules, etc. Detailed graphics of the HVAC systems showing all control parameters shall be provided. Prior to final graphical programming, a conference between the Contractor, Owner and the Engineer shall be held to determine all requirements for the graphical interface between the DDC system and the Owner's personnel.
2. ALL normal user programmable points shall be accessible through graphical interface at the Owner's host computer. Owner shall have the ability to graphically view the status of the points (e.g., water temperatures, outdoor air temperature, supply temperature, setpoint, space temperature, etc.) and graphically change temperature setpoint. Owner shall have the ability to graphically view status of equipment points, and graphically change appropriate set points, schedules, etc., with a mouse by clicking on the icon on the monitor.

C. Off-Site Interface: Control Contractor shall reprogram/modify/upgrade the Owner's existing off-site remote control center and software to allow full control and monitoring of this building off-site.

D. Web Based Access Requirements:

1. Access to system by up to 5 concurrent authorized users from any computer with an Internet connection and Microsoft Internet Explorer installed.
2. Full Graphical interface
3. Ability to manage and restrict authorization levels of each user.
4. The need for the FMS manufacturer to install any proprietary software is not acceptable. The system should be accessible from any computer connected to the owners LAN system using a standard web browser.

5. The Web based access should be integral to the control system the need to “bolt” on a separate piece of hardware to achieve this is not acceptable

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that power supply is available to control devices and operator workstation.

B. Verify that duct-, pipe-, and equipment-mounted devices are installed before proceeding with installation.

3.2 INSTALLATION

A. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

B. Connect and configure equipment and software to achieve sequence of operation specified.

C. Install labels and nameplates to identify control components according to Division 15 Section "Mechanical Identification."

D. Install hydronic instrument wells, valves, and other accessories according to Division 15 Section "Hydronic Piping."

E. Install an 11" x 17" set of control drawings in the main mechanical room in a hinged wall mounted cabinet. Each drawing shall be laminated, and drawings shall be bound together with a single metal ring. Provide bakelite label on cabinet cover engraved with "Control Drawings."

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install all systems in accordance with manufacturer’s installation instructions, NFPA-70 and NFPA-90A.

B. Installation of Conduit and Wiring:

1. All wiring and conduit installed under this section of the specifications shall be installed by a state-licensed contractor(s) and all work shall be done by state-certified technicians. All wiring systems shall be color coded and conductors shall be tagged at all junctions and terminals. Label cables identification numbers as directed by Owner. The Engineer and Owner reserves the right to move any device fifteen (15) feet without additional costs before the device is installed. All wiring and conduit shall be installed in accordance with Division 16 - Electrical.
2. All wiring shall be installed in conduit, except for plenum rated cable as specified below.
3. All conduit shall be concealed, except in mechanical/ electrical rooms.
4. On existing construction areas, surface metal raceway will be allowed.
5. All control wiring above suspended ceiling, not made inaccessible by equipment, ductwork or structure, may be plenum rated cable with flame spread of 25 or less and smoke development of 50 or less as tested by ASTM-E84. This plenum rated

cable is not required to be installed in conduit, but shall be run in a workmanlike manner, parallel to the building lines, properly supported at regular intervals, and not draped over conduit, piping and ductwork. Attach cable above ceiling to structure using appropriate fasteners for type of construction involved. Cable shall not lay atop ceiling. Where physical damage is possible, mechanical protection shall be used. All splices or connections shall be made at equipment served. Where communication loops are run, terminations shall be at terminal strip on equipment. No splices in field shall be allowed. The use of snap in bushings or connectors is required where cable is entering a knockout or equipment housing. All penetrations through wall sleeves shall be sleeved with conduit with bushings on both ends.

6. Contractor shall provide a conduit location plan and submit to the Architect for review prior to installing conduit and control devices. Conform to requirements of Architect concerning patching of existing walls. Cutting of molding, crown molding, base molding, etc., and any other items determined by the Architect shall be prohibited.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

3.5 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.
2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
4. Control System Inputs and Outputs:

    a. Check analog inputs at 0, 50, and 100 percent of span.
    b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
    c. Check digital inputs using jumper wire.
    d. Check digital outputs using ohmmeter to test for contact making or breaking.
    e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Flow:

    a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
    b. Manually operate flow switches to verify that they make or break contact.

6. Pressure:

    a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
    b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.

7. Temperature:

    a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
    b. Calibrate temperature switches to make or break contacts.

8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
10. Provide diagnostic and test instruments for calibration and adjustment of system.
11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls.

3.7 TRAINING

A. Provide training of Owner’s personnel in accordance with provisions of Section 15051.

B. Training Course Content: For guidance in planning the required instruction, the contractor shall assume that attendees will have a high school education or equivalent, and are familiar with HVAC systems. The training course shall cover all of the material contained in the Operating and Maintenance Instructions, the layout and location of each HVAC control panel, the layout of one of each type of unitary equipment and the locations of each, the location of each control device external to the panels, preventive maintenance, troubleshooting, diagnostics, calibration, adjustment, commissioning, tuning and repair procedures. Typical systems and similar systems may be treated as a group, with

instruction on the physical layout of one such system. The results of the performance verification test and the calibration, adjustment and commissioning report shall be presented as benchmarks of HVAC control system performance by which to measure operation and maintenance effectiveness.

3.8 MANUALS

A. The following manuals shall be provided:

1. An Operators Manual with graphic explanations of operator functions. Although operator functions are to be self-instructional and menu interactive from the keyboard terminal, this manual shall be for off-line study and refresher use.
2. A Programmer's Manual with graphic descriptions of functions required for software modifications and development. Although high level languages such as PASCAL are required to be usable on the system, full PASCAL type manuals and training are not required. The use and installation of PASCAL type programs shall be included in this manual. This programmer's manual shall include computer generated listings of all DDC programs.
3. Computerized printouts of all NCP data file construction including all point processing assignments, physical terminal relationships, scales, and offsets, command and alarm limits, etc.
4. A user manual for the integrated spreadsheet package.
5. A manual including revised "As Built" documents of all materials required under the paragraph "SUBMITTALS" on this specification.
6. Three Operators Manuals, two Programmers, and two As Built Manuals shall be provided to the Owner.

3.9 ALARMS

A. All alarms specified herein shall send a signal to the host computer(s) and offsite interface to notify the Owner of an alarm condition.

3.10 DDC CONTROLLER LOCATIONS:

A. Controls contractor shall mount DDC controllers in a location acceptable to the Owner.

3.11 SEQUENCE OF OPERATION

A. Overall Building Control Description:

1. Time Clock Program: Owner shall provide Contractor with the required start/stop times for each piece of equipment so the Contractor can program the individual start/stop time for each piece of equipment. Equipment which shall be start/stopped by the time clock program is indicated in later paragraphs. All other equipment not started by the time clock program will be started and stopped as described in later paragraphs of this section of specifications.

2. Override Timer Programs: Override timer programs shall override the time clock program during its "OFF" cycles to re-start the equipment in its normal operating mode. Room temperature sensors shall be provided with integral pushbutton override to restart equipment in normal operating mode for a preprogrammed (one hour, adjustable) duration.
3. Night Setback Programs: Night setback temperature programs shall override the time clock program during its "off" cycles, when the space temperature drops below setpoint (55°F, adjustable) to restart the respective equipment to satisfy the room temperature night setback setpoint (as sensed by the respective room temperature sensor.)
4. Morning Warm Up and Cool Down Programs: During morning hours, prior to building occupancy, equipment as specified in later paragraphs shall operate until space temperature sensors reach 75°F (adjustable). Control system shall “learn” the time required to perform this function and shall adjust the start time to bring the equipment on at the appropriate time (optimum start). During morning warm up, equipment as specified in later paragraphs to remain off shall not operate.
5. Power Outage Recovery Control: In the event of a power outage, the control system shall be restored to its last state (prior to power outage) as quickly as possible after power has been restored. Setpoints shall not be lost during power outages.

B. Sequence of Operation for Hot Water Plant with Shell and Tube Heat Exchanger:

1. General: Hot water will be required when outside temperature is below 65°F (adjustable)
2. Hot Water Pump Start/Stop: The hot water pump shall run when the outside air temperature is below 65°F (adjustable) and when the control system’s time clock program is in the occupied mode, override timer program is enabled, night setback program is enabled or morning warm up program is enabled. The control system shall alternate from lead to lag pump every seven (7) days to equalize pump wear. The control system shall switch to automatic back-up in the event of lead hot water pump failure. Automatic back-up pump shall be started in the event that lead pump flow is not proven within 15 seconds of start signal by differential pressure switch and auxiliary starter contact. An alarm shall be sent to Owner’s on site (if specified) and off site host computer advising of pump failure.
3. Steam-To-Hot Water Heat Exchanger Control: Two position steam control valve upstream of steam temperature regulating valve shall open (via signal from DDC system) whenever hot water pump is operating. Self-contained steam temperature regulating valve shall then modulate steam flow as required to maintain hot water supply temperature setpoint of 140°F. When hot water pumps stops, two position control valve shall close.

END OF SECTION 15900

SECTION 15950

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes TAB to produce design objectives for the following:

1. Hydronic Piping Systems.
2. Steam systems.
3. Verifying that automatic control devices are functioning properly.
4. Reporting results of activities and procedures specified in this Section.

1.3 SUBCONTRACTOR COORDINATION

A. Testing, Adjusting and Balancing (TAB) work shall be performed by NEBB/AABC agent as described in this section of the specifications; however, all devices that the TAB agent will be required to perform work on described in this section, shall be provided by the Contractors's Division 15 mechanical sub-contractor(s). These devices include, but are not limited to: balancing dampers, "Petes" plugs, re-insulation of ductwork after duct test holes are drilled by TAB agent, adjustable sheaves, pulleys, belts, balance valves, etc. and the labor to install these devices. Sub-contractor(s) providing the Division 15 HVAC systems must provide labor to support the TAB Agent. The mechanical systems shall be fully operational and ready for TAB work to begin a minimum of four weeks prior to the Contractual date of "Substantial Completion". Additionally, the Division 15 Contractor(s) shall furnish a qualified technician(s)/mechanic(s) to assist the TAB agent in the performance of his duties until all work specified herein is accomplished. The Division 15 sub-contractor(s) shall correct all deficiencies found by the TAB agent.

1.4 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

C. TAB: Testing, adjusting, and balancing.

D. Test: A procedure to determine quantitative performance of systems or equipment.

E. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.5 SUBMITTALS

A. Qualification Data: Within 45 days from Contractor's Notice to Proceed, submit 4 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Sample Report Forms: Submit four sets of sample TAB report forms.

C. Contract Documents Examination Report: Within 45 days from Contractor's Notice to Proceed, submit 4 copies of the Contract Documents review report as specified in Part 3.

D. Certified Final TAB Reports: Submit four copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

1.6 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB. Test and balancing by non-AABC or non-NEBB firms is not allowed.

B. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

C. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

D. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.7 OCCUPANCY DURING TAB PROCEDURE

A. Owner Occupancy: TAB agent shall verify if Owner will occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.8 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times. Test and Balance Agent shall contact Engineer and Owner 48 hours prior to test and balance work to allow (but not require) Engineer and owner to be present during TAB work.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.9 WARRANTY

A. Performance Guarantee:

1. Provide one of the following:

a. Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents.
b. Provide a guarantee on NEBB forms stating that NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee for either AABC or NEBB shall include the following provisions:

1) The certified TAB firm has tested and balanced systems according to the Contract Documents.
2) Systems are balanced to optimum performance capabilities within design and installation limits.

B. TAB work shall be guaranteed by AABC or NEBB. Submit copy of AABC or NEBB National Performance Guaranty when final balance report is submitted. If for any reason, the TAB agency fails to comply with the specifications, with the exception of termination of business by the TAB agency, equipment malfunction or inadequacy, which prevents proper balancing of the systems, the Associated Air Balance Council or NEBB shall provide supervisory personnel to assist the TAB agency to perform work in accordance with AABC or NEBB standards. As part of this Performance Guaranty, the engineer or building owner may call upon AABC or NEBB to assist him with any technical and/or field problems pertaining to the final balanced condition of the systems. These services will be made available at no additional charge by the TAB agency or by AABC or NEBB National Headquarters.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment. Provide Contract Documents Examination Report to report on acceptability and/or deficiencies in Contract Documents.

1. Contract Documents are defined in the General and Supplementary Conditions of Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

D. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

E. Report deficiencies discovered before and during performance of TAB procedures.

3.2 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.3 SAFETY CONTROLS DATA

A. Provide unit designation or location with description of device and setpoint. Activate and verify operation of all safety devices. Smoke detectors shall be activated with smoke. Test button activations is not acceptable.

3.4 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.

2. Check expansion tank pre-charge pressure.
3. Check makeup-water-station pressure gage for specified pressures.
4. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
5. Set system controls so control valves are wide open to heat exchangers or coils.
6. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
7. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.5 PROCEDURES FOR HYDRONIC SYSTEMS

A. Measure water flow at pumps. Use the following procedures, except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within plus or minus 5 percent of design.

B. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

3.6 PROCEDURES FOR STEAM SYSTEMS

A. Measure and record upstream and downstream pressure of each piece of equipment.

B. Measure and record upstream and downstream steam pressure of pressure-reducing valves.

C. Check the setting and operation of automatic temperature-control valves, self-contained control valves, and pressure-reducing valves. Record the final setting.

D. Check the settings and operation of each safety valve. Record settings.

E. Verify the operation of each steam trap.

3.7 TEMPERATURE-CONTROL VERIFICATION

A. Record thermostat/sensor controller settings and note variances between set points and actual measurements.

B. Check free travel and proper operation of control devices such as damper and valve operators.

C. Check the sequence of operation of control devices. Note the speed of response to input changes.

D. Note operation of electric actuators using spring return for proper fail-safe operations.

3.8 HYDRONIC BALANCE PERFORMANCE REQUIREMENTS

A. Measurements: Flow meters, venturis, balancing valves, or pressure compensating flow control valves with flow taps shall be used to balance water flows. Where these items are not installed, flow rated shall be obtained by pressure drop across valves or equipment using factory provided C_V data (known pressure drops vs. flow curves through heat exchanger). If no provision is available for actual flow measurements as listed above, balancing shall be performed by the temperature differential method, but the temperature differential method shall be performed only after specified air balancing has been completed. Pump flow rates shall be measured by flow meters, balancing valves with flow taps, or differential pressure measurements.

B. Adjustments: All hydronic circuits shall be adjusted by the use of the specified balancing valves. All balancing valves shall be permanently marked after balancing is completed so they may be returned to the correct position if disturbed.

3.9 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Heating-Water Flow Rate: Plus 10 percent to minus 10 percent.

3.10 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 CERTIFIED FINAL TAB REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm and telephone number.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for pump performance forms.

D. Final Report Contents: In addition to certified field report data, include the following:

1. Pump curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Water and steam flow rates.
2. Pipe and valve sizes and locations.
3. Position of balancing devices.

F. All Electric Motors (Data To Be Tabulated With Equipment Driven By Motor)

1. Manufacturer
2. HP (nameplate)
3. Phase, voltage, amperage; nameplate, actual

4. RPM
5. Service factor (if applicable)
6. Starter size, rating, heater elements (if applicable)
7. Motor winding insulation class

G. Shell And Tube Heat Exchanger

1. Hot water gpm, entering and leaving water temperature and pressure drop
2. Steam flow lb./hr, entering and leaving water temperature and pressure drop

3.12 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
2. Randomly check the following for each system:

a. Measure airflow of at least 10 percent of air outlets.
b. Measure water flow of at least 5 percent of terminals.
c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Verify that balancing devices are marked with final balance position.
e. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Owner.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Owner.
3. Owner shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

3.13 ADDITIONAL TESTS

A. Provide field test of non-CTI towers in accordance with CTI towers in accordance with CTI ATC-105. See previous paragraph "Cooling Towers" in the section and also see Section 15714 of the specifications.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

3.14 REPORT

A. Provide four copies of the Test and Balance report to the Architect/Engineer by the earlier of the following two dates:

1. A minimum of 48 hours prior to the semi-final on-site project construction site review by the Architect/Engineer.
2. Four weeks prior to the date the facility is scheduled to be turned over to the Owner.

B. TAB work shall be guaranteed by AABC or NEBB. Submit copy of AABC or NEBB National Performance Guaranty when final balance report is submitted. If for any reason, the TAB agency fails to comply with the specifications, with the exception of termination of business by the TAB agency, equipment malfunction or inadequacy, which prevents proper balancing of the systems, the Associated Air Balance Council or NEBB shall provide supervisory personnel to assist the TAB agency to perform work in accordance with AABC or NEBB standards. As part of this Performance Guaranty, the engineer or building owner may call upon AABC or NEBB to assist him with any technical and/or field problems pertaining to the final balanced condition of the systems. These services will be made available at no additional charge by the TAB agency or by AABC or NEBB National Headquarters.

END OF SECTION 15950

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code (2011).

1.3 SUBMITTALS

A. Submit under the following provisions:

1. Submittal Procedures:
2. Identify Project, Contractor and Subcontractor as appropriate.
3. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.
4. Schedule submittals to expedite the Project, and deliver to Architect at business address. Coordinate submission of related items.
5. Shop drawings and data submittals for materials requiring extra long delivery time shall be submitted for approval as soon as possible after execution of contract. No substitutions of materials or extensions of contract time will be allowed for contractors' failure to order such materials sufficiently in advance of the work.
6. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
7. Revise and resubmit submittals as required, identify all changes made since previous submittal.
8. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

B. Shop Drawings: Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Architect/Engineer.

C. Acceptable Products: Where a manufacturer has been listed as being acceptable in the various specification sections hereinafter for a certain product, it shall be understood that the manufacturer has been approved as being capable of producing this product. This does not necessarily constitute approval of his producing this product. This does not necessarily constitute approval of his standard product. His product shall still comply with all of the requirements and standards of this specification and not necessarily his standard specification, to the extent that it might require special manufacture to meet the requirement and standards of this specification.

D. Product Data:

1. Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Architect/Engineer.
2. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

E. Proposed Products List: Include Products specified in the following Sections:

1. Section 16111 - Conduit.
2. Section 16123 - Building Wire and Cable.
3. Section 16195 - Electrical Identification.
4. Section 16440 - Disconnect Switches.
5. Section 16480 - Motor Control.

F. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal. Submittal shall be tabbed, indexed, and bound in a minimum 1" three ring binder. Submittals received "piece-mail" will be returned without review.

G. Mark dimensions and values in units to match those specified.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable Building Code for City of Milledgeville and Baldwin County, Georgia.

B. Electrical: Conform to NFPA 70.

C. Obtain permits, and request inspections from authority having jurisdiction.

1.5 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

1.6 GUARANTEE AND WARRANTIES

A. Guarantee: All equipment and materials furnished and all work performed under this section of specifications shall be guaranteed to be free of defective materials and workmanship for a period of one year (unless a longer period is specified elsewhere) after final acceptance of the work by the Owner. Upon notice from the Owner of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be promptly replaced with new parts by the Contractor at no additional cost to the Owner. All labor required to perform guarantee shall be included as part of the complete guarantee warranty.

B. Warranties: Provide manufacturer's equipment warranties prior to final inspection. See other paragraphs in other sections of specifications for specific additional equipment warranties.

END OF SECTION 16010

SECTION 16060

ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Electrical demolition.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.

B. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Engineer before disturbing existing installation.

C. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

B. Existing Electrical Services: Maintain existing systems in service during construction. Disable systems only to make connections and change-over to new service. Obtain permission from Owner at least 14 days before partially or completely disabling any existing system. Minimize outage duration.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of this Section.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

F. Repair adjacent construction and finishes damaged during demolition and extension work.

G. Maintain access to existing electrical installations which remain active.

H. Extend existing installations using materials and methods as specified.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

3.5 INSTALLATION

A. Install relocated materials and equipment, as noted on drawings, under the provisions of Division 16.

END OF SECTION 16060

SECTION 16111

CONDUIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Metal conduit.

B. Flexible metal conduit.

C. Liquidtight flexible metal conduit.

D. Electrical metallic tubing.

E. Fittings and conduit bodies.

1.3 RELATED SECTIONS

A. Section 16130 - Boxes.

B. Section 16170 - Grounding and Bonding.

C. Section 16190 - Supporting Devices.

D. Section 16195 - Electrical Identification.

1.4 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

D. ANSI/NFPA 70 - National Electrical Code.

E. NECA "Standard of Installation."

1.5 DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70.

1.6 SUBMITTALS

A. Submit under provisions of Section 16010.

1.7 PRODUCT DATA

A. Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, fittings and conduit bodies.

1.8 PROJECT RECORD DOCUMENTS

A. Accurately record actual routing of conduits larger than 2 inches.

1.9 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Accept conduit on site. Inspect for damage.

B. Protect conduit from corrosion and entrance of debris by storing above grade.

C. Provide appropriate covering.

1.11 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 - PRODUCTS

2.1 CONDUIT REQUIREMENTS

A. Minimum Size: 1/2 inch unless otherwise specified. EMT shall be used in sizes 1-1/4 inches and smaller only.

B. Outdoor Locations, Above Grade: Use rigid steel conduit or intermediate metal conduit.

C. Wet and Damp Locations: Use rigid steel conduit or intermediate metal conduit.

D. Dry Locations: Use rigid steel conduit, intermediate metal conduit, or electrical metallic tubing.

E. Metal Conduit:

1. Rigid Steel Conduit: ANSI C80.1.
2. Intermediate Metal Conduit (IMC): Rigid steel.

F. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

G. Flexible Metal Conduit:

1. Description: Interlocked steel construction.
2. Fittings: ANSI/NEMA FB 1.

H. Liquidtight Flexible Metal Conduit:

1. Description: Interlocked steel construction with PVC jacket.
2. Fittings: ANSI/NEMA FB 1.

I. Electrical Metallic Tubing (EMT):

1. Description: ANSI C80.3; galvanized tubing.
2. Fittings and Conduit Bodies: ANSI/NEMA FB 1; insulated throat steel compression type. Set screw or indenter type are unacceptable.

J. Acceptable Manufacturers: Acceptable manufacturers of conduit products specified herein are as follows: Allied, Triangle, Wheatland, LTV or Carlon.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation."

B. Arrange supports to prevent misalignment during wiring installation.

C. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

D. Fasten conduit supports to building structure and surfaces under provisions of Section 16190.

E. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports

F. Do not attach conduit to ceiling support wires.

G. Arrange conduit to maintain headroom and present neat appearance.

H. Route exposed conduit parallel and perpendicular to walls.

I. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

J. Do not install conduits in slab.

K. Maintain adequate clearance between conduit and piping.

L. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

M. Cut conduit square using saw or pipecutter; de-burr cut ends.

N. Bring conduit to shoulder of fittings; fasten securely.

O. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

P. Install no more than equivalent of four 90-degree bends between boxes.

Q. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

R. Provide insulating bushings on all RGS and IMC conduits entering wireways, pullboxes, cabinets, panelboards, etc.

S. Use "Push-Pennies" to protect installed conduit against entrance of dirt and moisture.

T. Ground and bond conduit under provisions of Section 16170.

U. Where connections to free-standing equipment in excess of 18" from structure are required, a vertical, minimum size 3/4", rigid conduit secured to ceiling and floor shall be utilized with wiring into this conduit by means of a rigid connection to a conduit body and wiring from this conduit by means of a conduit body with a flexible conduit connection to equipment.

V. Flexible conduit shall not exceed 2'-0" in length unless specified otherwise.

END OF SECTION 16111

SECTION 16123

BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Building wire and cable.

B. Wiring connectors and connections.

1.3 RELATED SECTIONS

A. Section 16111 - Conduit.

B. Section 16130 - Boxes.

C. Section 16195 - Identification.

1.4 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.5 SUBMITTALS

A. Submit under provisions of Section 16010.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. suitable for purpose specified and shown.

1.7 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. All conductors shall be copper.

C. Routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions. Include wire and cable lengths within 10 feet of length shown.

D. Where routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.8 COORDINATION

A. Determine required separation between this and other work.

B. Determine routing to avoid interference with other work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - BUILDING WIRE AND CABLE

A. Only product of domestic manufacturer will be accepted.

B. Manufacturers: Allied, American Insulated, Carol, Pirelli, Rome, Southwire or Triangle.

C. Substitutions: Engineer approved equals.

2.2 BUILDING WIRE AND CABLE

A. Description: Single conductor insulated wire.

B. Conductor: Copper no exceptions. Solid conductor for 10AWG and smaller; stranded for 8AWG and larger.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: ANSI/NFPA 70; Type XHHW insulation for feeders and branch circuits 6 AWG and larger; Type THHN/THWN insulation for feeders and branch circuits 8 AWG and smaller. At the Contractors option, type THHN/THWN insulation may be utilized throughout for all feeders and branch circuits.

2.3 WIRING CONNECTORS

A. Solderless Pressure Connectors: 3M Scotch-loks or Ideal Wing Nut for 10 AWG and smaller

B. Compression Connectors: Burndy Hydent or Thomas and Betts, Color-Keyed for 8 AWG and larger.

C. Terminal Lugs: Thomas and Betts STA-KON for 10 AWG and smaller; Thomas and Betts Color-Keyed for 8 AWG and larger.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that conduit systems are complete.

B. Verify that mechanical work likely to damage wire has been completed.

C. Verify that construction has been protected from weather.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

A. Use wiring methods as specified and indicated on Drawings.

3.4 INSTALLATION

A. Install products in accordance with manufacturers instructions.

B. Use conductor not smaller than 12 AWG for power and lighting circuits.

C. Pull all conductors into raceway at same time.

D. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

E. Protect exposed cable from damage.

F. Neatly train and lace wiring inside boxes, equipment, and panelboards using Thomas and Betts Ty-raps.

G. Clean conductor surfaces before installing lugs and connectors.

H. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

I. Where compression connectors are used for conductor splices and taps; tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

J. Use terminal lugs for connecting all conductors and for all multiple connections to terminals.

3.5 INTERFACE WITH OTHER PRODUCTS

A. Identify wire and cable under provisions of Section 16195.

3.6 FIELD QUALITY CONTROL

A. Inspect wire for physical damage and proper connection.

B. Measure tightness of bolted connections and compare torque measurements with code recommended values.

C. Verify continuity of each branch circuit conductor.

END OF SECTION 16123

SECTION 16130

BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Pull and junction boxes.

1.3 RELATED SECTIONS

A. Section 16141 - Wiring Devices: Mounting heights of wiring device outlets.

B. Section 16180 - Equipment Wiring Systems.

1.4 REFERENCES

A. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.

B. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

C. ANSI/NFPA 70 - National Electrical Code.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.6 PROJECT CONDITIONS

A. Verify field measurements are as shown on Drawings.

B. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose. Include installation within 10 feet of location shown.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.

B. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.

C. Cast Boxes: NEMA FB 1, Type FD, cast feralloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

2.2 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Mounting heights as specified in other sections shall be to the bottom of the outlet.

C. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

E. Install boxes to preserve fire resistance rating of partitions and other elements.

F. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

G. Use flush mounting outlet boxes in finished areas.

H. Secure flush mounting box to interior wall. Accurately position to allow for surface finish thickness.

I. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

J. Use adjustable steel channel fasteners for hung ceiling outlet box.

K. Do not fasten boxes to ceiling support wires.

L. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

M. Use gang box where more than one line voltage device is mounted together. Do not use sectional box.

N. Use separate boxes for low voltage systems. Do not install line voltage and low voltage devices within same outlet.

O. Use 4 inch square box with plaster ring for single device outlets.

P. Use cast outlet box in exterior locations exposed to the weather and wet locations.

3.2 ADJUSTING

A. Install knockout closure in unused box opening.

END OF SECTION 16130

SECTION 16170

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDED

A. Power system grounding.

B. Electrical equipment and raceway grounding and bonding.

1.3 RELATED SECTIONS

A. Section 16123 - Building Wire and Cable.

1.4 SYSTEM DESCRIPTION

A. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, cable tray systems, grounding conductor in raceways and cables, and receptacle ground connectors.

B. Provide a separate grounding conductor in all flexible and non-metal conduits.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Conductors: Soft drawn copper conductor as specified in Section 16123.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

END OF SECTION 16170

SECTION 16180

EQUIPMENT WIRING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDED

A. Electrical connections to equipment specified under other Sections or furnished by Owner.

1.3 RELATED WORK

A. Section 16111 - Conduit.

B. Section 16123 - Wire and Cable.

C. Section 16130 - Boxes.

D. Section 16141 - Wiring Devices.

PART 2 - PRODUCTS: NOT USED.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.3 INSTALLATION

A. Do not make improper connections to equipment.

B. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

C. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit in damp or wet locations.

D. Provide suitable strain-relief clamps for cord connections to equipment connection boxes.

E. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.

F. Install disconnect switches, controllers, control stations, and control devices such as limit switches, etc. as indicated. Make connections to and through these devices with conduit and wiring as indicated.

G. Where line voltage control devices are utilized for HVAC equipment specified under Division 15, make wiring connections to and through freezestats, fire stats, thermostats and other devices as required.

H. The motor horsepowers, voltages and phases shown on the drawings are the estimated power requirements of all equipment furnished under other sections of these specifications. If equipment with larger horsepower, different voltages or phases is selected by the Contractor then the Contractor is responsible for the circuits (wire and conduit) and protective devices (circuit breakers, switches and starters) to be changed for the ampacity, voltage and phase actually to be installed. This coordination shall be accomplished between trades at no additional cost to the contract.

END OF SECTION 16180

SECTION 16190

SUPPORTING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDED

A. Conduit and equipment supports.

B. Fastening hardware.

1.3 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

1.4 RELATED SECTIONS

A. Section 16195 - Electrical Identification: Color coding of Equipment Backboards

PART 2 - PRODUCTS

2.1 MATERIAL

A. Support Channel: Galvanized steel.

B. Hardware: Corrosion resistant, zinc plated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use toggle bolts in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors in solid masonry walls; or concrete surfaces; and sheet metal screws on plywood backboards.

B. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

C. Do not use powder-actuated anchors.

D. Do not drill structural steel members.

E. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts or double nuts jammed tight.

F. Install surface-mounted cabinets, panelboards, etc. with minimum of four anchors.

END OF SECTION 16190

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDED

A. Nameplates.

B. Wire color coding.

C. Panelboard directories.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 16010.

B. Include schedule for nameplates.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Nameplates: Engraved two-layer laminated plastic, black letters on a white background.

B. Tape: Vinyl plastic electrical tape.

C. Paint: Flat Enamel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Degrease and clean surfaces to receive nameplates

B. Install nameplates parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws. Do not apply with adhesives.

3.2 WIRE IDENTIFICATION

A. For building wire and cables in sizes 8 AWG and smaller provide with factory insulation to correspond to color code; in sizes 6 AWG and larger provide 3/4" colored tape bands in lieu of colored insulation.

B. Color coding for 120/208 volt system shall be as follows:

1. Phase A: Red
2. Phase B: Black
3. Phase C: Blue
4. Phase N: White
5. Phase G: Green

C. Color coding for 277/480 volt system shall be as follows:

1. Phase A: Brown
2. Phase B: Orange
3. Phase C: Yellow
4. Phase N: Grey
5. Phase G: Green

D. Nameplate Engraving Schedule:

1. Provide nameplates to identify all electrical distribution and control equipment, and loads served.
2. Provide nameplates of minimum letter height as scheduled below.
3. Panelboards: 1/4 inch; identify equipment designation. 1/8 inch; identify voltage rating.
4. Enclosed Switches, Circuit Breakers, Contactors, and Motor Starters: 1/8 inch; identify load served.

E. Panelboard Directories:

1. For all existing panelboards, provide neatly typewritten directory of each device usage.
2. Locate directory inside panelboard door. Protect directory with clear plastic.
3. Existing panelboard directories shall be utilized to identify loads in new panel schedules.

END OF SECTION 16195

SECTION 16440

DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDED

A. Disconnect switches.

B. Fuses.

C. Enclosures.

1.3 RELATED WORK

A. Section 16195 - Electrical Identification: Nameplates:

1.4 REFERENCES

A. ANSI/UL 198E - Class R Fuses.

B. NEMA KS 1 - Enclosed Switches.

1.5 SUBMITTALS

A. Submit product data under provisions of Section 16010.

1.6 SPARE PARTS

A. Fuses: Furnish three of each size and type to Owner.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

A. Nonfusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Cover interlock shall be defeatable. Handle lockable in OFF position.

B. Enclosures: NEMA type as indicated on Drawings.

C. Acceptable Manufacturers: Square D, Cutler-Hammer, Challenger, General Electric, Westinghouse, or Siemens ITE.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated on Drawings.

B. Provide nameplates in accordance with Section 16195.

END OF SECTION 16440

SECTION 16480

MOTOR CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDED:

A. Manual motor starters.

B. Magnetic motor starters.

C. Combination magnetic motor starters.

1.3 RELATED WORK:

A. Section 16195 - Electrical Identification: Nameplates

B. REFERENCES:

C. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

D. NEMA AB 1 - Molded Case Circuit Breakers.

E. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

1.4 SUBMITTALS:

A. Submit shop drawings and product data under provisions of Section 16010.

B. Provide product data on motor starters and combination motor starter, relays, pilot devices, and switching and overcurrent protective devices.

1.5 OPERATION AND MAINTENANCE DATA:

A. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Store in a clean, dry space. Maintain factory wrapping or provide plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Handle carefully to avoid damage to motor control components, enclosure, and finish.

1.7 SPARE PARTS:

A. Overloads: Furnish 3 each size to Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - MOTOR STARTERS:

A. Acceptable Manufacturers: Square D, Cutler-Hammer, Siemens or General Electric.

2.2 MANUAL MOTOR STARTERS:

A. Motor Starting Switch: NEMA ICS 2; AC general-purpose Class A manually operated 2 pole, full-voltage controller for fractional horsepower induction motors, without thermal overload unit.

B. Enclosure: NEMA ICS 6; type 1, toggle style with handle lock accessory.

2.3 MAGNETIC MOTOR STARTERS:

A. Magnetic Motor Starters: NEMA ICS 2; AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

B. Full Voltage Starting: Non-reversing type, unless scheduled or noted otherwise.

C. Coil Operating Voltage: 120 volts, 60 Hertz, from separate source.

D. Size: NEMA ICS 2; size as shown on Drawings.

E. Overload Relay: NEMA ICS 2; ambient compensated, bimetal.

F. Enclosure: NEMA ICS 6; Type 1.

G. Combination Motor Starters: Combine motor starters with motor circuit protector disconnect in common enclosure.

H. Auxiliary Contacts: NEMA ICS 2; two normally open field convertible contacts in addition to "latching" contact.

I. Selector Switches: NEMA ICS 2; HAND/OFF/AUTO, in front cover of all combination starters.

J. Indicating lights: NEMA ICS 2; Transformer base pilot device with 9 volt lamp, GREEN "motor run" in front cover.

K. Overload Reset: Externally operable in front cover.

2.4 OVERCURRENT PROTECTION AND DISCONNECTING MEANS:

A. Molded Case Thermal-Magnetic Circuit Breakers (non-motor loads): NEMA AB1; circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Minimum 65 kAIC device.

B. Motor Circuit Protector: NEMA AB 1; circuit breakers with integral instantaneous magnetic trip in each pole. Provide auxiliary contact for disconnection of starter control circuit(s).

PART 3 - EXECUTION:

3.1 INSTALLATION:

A. Install motor control equipment in accordance with manufacturer's instructions.

B. Select and install heater elements in motor starters to match installed motor characteristics.

C. Motor Data: Provide neatly typed label inside each motor starter enclosure cover identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

D. Provide nameplates for individual motor starters. Nameplates shall be in accordance with Section 16195.

END OF SECTION 16480