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

VAV BOXES AND CONTROLS REPLACEMENT IN ACADEMIC BUILDING AT GORDON COLLEGE BARNESVILLE, GEORGIA

Andrews, Hammock & Powell, Inc.
Telephone: (478) 405-8301
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June 18, 2012

SECTION A - INVITATION TO BID

Sealed bids from general or mechanical contractors will be received by Gordon College, Owner, at the Plant Operations Conference Room, 419 College Drive, Barnesville, Georgia, until **2:00 pm**, at the time legally prevailing in Barnesville, Georgia, on **Thursday, July 12, 2012** for the project titled **"VAV Boxes and Controls Replacement in Academic Building at Gordon College, Barnesville, Georgia"**. At the time and place noted above, the bids will be publicly opened and read.

A mandatory site visit will be held at the Plant Operations Conference Room, 419 College Drive, Barnesville, Georgia at **2:00 pm**, at the legally prevailing time on **Tuesday, June 26, 2012**. All contractors who submit a bid must have a representative at this meeting.

Electronic bidding documents may be obtained at the office of the Architect/Engineer listed below:

Andrews, Hammock & Powell, Inc.
250 Charter Lane, Suite 100
Macon, Georgia 31210
Phone: (478) 405-8301
Email: khopkins@ahpengr.com

Bidders are cautioned that acquisition of bidding documents through any source other than the office of the engineer or the procurement website 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 his bid. Acquisition of bidding documents from others shall be at the bidder's own risk.

Bidding material will be forwarded; shipping charges collect, as soon as possible. The full amount of deposit for one set will be refunded to each general contractor who submits a bona fide bid upon return of such set in good condition within 30 days after date of opening of bids. One half of all other deposits will be refunded upon return of complete documents in good condition within 30 days after date of opening of bids. "Good condition" is defined to require that documents not have been taken apart or marked in a manner which limits their re-use for construction.

Contract, if awarded, will be on a lump sum basis. No bid may be withdrawn for a period of 35 days after time has been called on the date of opening. Bids must be accompanied by a bid bond made payable to the Owner in an amount not less than 5% of the base bid. Both a performance bond and a payment bond will be required each in an amount equal to 100% of the contract price.

The Owner reserves the right in its sole and complete discretion to reject any or all bids and to waive technicalities and informalities.

GORDON COLLEGE, BARNESVILLE, GEORGIA

Richard Vereen, Director of Facilities

SECTION B - BID FORM

Date: _____

TO: Gordon College
Plant Operations
419 College Drive
Barnesville, Georgia 30204

Re: VAV Boxes and Controls Replacement in Academic Building at Gordon College
Barnesville, Georgia

Gentlemen:

B.O1. Having carefully examined the Specifications entitled **VAV BOXES AND CONTROLS REPLACEMENT IN ACADEMIC BUILDING AT GORDON COLLEGE - BARNESVILLE, GEORGIA** and the drawings of the same title designated T1, M1, M2, M3 and E1 all dated **June 18, 2012** and Addendum(a) No.(s). _____ through _____ as well as the premises and conditions affecting the work, we propose to furnish all services, labor and materials called for by them for the entire work, in accordance with the aforesaid documents, for the sum of:

_____ Dollars ($_____)
which sum is herein after called the base bid.

B.O2. For and in consideration of the sum of $1.00, the receipt of which is hereby acknowledged, we 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 option which shall remain open for acceptance for a period of thirty-five (35) days following such time.

B.O3. In case we be notified in writing by mail, telegraph, or delivery of the acceptance of this bid within thirty-five days after time set for the opening of bids, we agree to execute within ten (10) days a contract (Form of Agreement between Contractor and Owner, Form No. 418) for the Work for the above stated compensation and at the same time to furnish and deliver to the Owner a Performance Bond and a Payment Bond in accordance with the forms shown in Article E-30 of the General Conditions of the contract, both in an amount of equal to 100% of the contract sum.

B.O4 We agree to prepare submittals, procure equipment and materials to begin 14 days after the contract is executed. Actual start date will be provided in written order of the Owner. Upon issuance of a Notice to Proceed Order, Contractor agrees to commence physical activities on the Site with adequate forces and equipment and to complete to Material Completion all work in **90 (ninety) consecutive calendar days** beginning the day after the date of the Notice to Proceed Order.

B.O5 Enclosed herewith is a bid bond (CERTIFIED CHECKS NOT ACCEPTABLE) in the amount of _____ Dollars ($_____) (being not less than 5% of the base bid). We agree that the above stated amount is the proper measure of liquidated damages which the Owner will sustain by our failure to execute the contract and to furnish the Performance and Payment Bonds in case this bid is accepted.

B.06 If this bid is accepted within thirty-five (35) days after the date set for the opening of bids and we fail to execute the contract within ten (10) days after written notice of such acceptance or if we fail 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, obligations of the bond will be null and void.

B.O7 This request is made for statistical purposes only.

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

____ MINORITY BUSINESS ENTERPRISE (MBE) - The business is either: a) owner 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 an individual who is a member of a race, which comprises less than 50 percent of the total population of the State of Georgia. For record keeping 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) - If a business meets the definition of a minority owner 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) if minority stockholders report earnings for Georgia minority business enterprise.

____ NEITHER DESCRIPTION APPLIES TO YOUR COMPANY.

B.O8 The bidder submits the following statement of bidder=s qualifications for consideration by the Owner.

STATEMENT OF BIDDER"S GENERAL QUALIFICATIONS

(To be subscribed and sworn to before a notary public)

Legal Name of Bidder _____

Street Address _____

When Organized _____

Where Incorporated _____

Number of years engaged in the contracting business under the present firm name _____

Credit Available for this contract $ _____

Contracts now in hand, Gross Amount $_____

Plan of Organization (Proprietorship) (Corporation) (Partnership)

The bidder has never refused to sign a contract at the original bid.

The bidder has never been declared in default on a contract.

Remarks: _____

The foregoing statement of facts in the foregoing bid is true.

B.09. Under oath I certify that I am a principal or other representative of the firm listed above and that I am authorized by it to execute the foregoing offer on its behalf. I am a principal person of the foregoing with management responsibility for the foregoing subject matter and as such I am personally knowledgeable of all its pertinent matters. The foregoing statement of facts in the foregoing bid are true.

B.10. I certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, or person submitting a bid for the same materials, labor, supplies, or equipment and is in all respects fair and without collusion or fraud. We understand collusive bidding is a violation of state and federal law and can result in fines, prison sentences, and civil damage awards. We agree to abide by all conditions of this bid.

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

_____

_____

_____

The foregoing statement of qualifications is submitted under oath.

DATE: _____

LEGAL NAME OF FIRM: _____

BY: _____

TITLE: _____

Sworn to and subscribed before me this ____ day of _____, 2010

_____ Notary Public

My commission expires:

SECTION C - INSTRUCTIONS TO BIDDERS

C-01. Basis of Contract. See Invitation to Bid and Bid Form.

C-02. Bid Security. - See Invitation to Bid and Bid Form.

C-03. 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 Architect not later than five (5) days prior to the date set for receipt of the bids, and failure on the part of the successful bidder to do so shall not relieve him as Contractor of the obligation to execute such work in accordance with a later interpretation by the Architect. All interpretations made to bidders will be issued in the form of addenda to the plans and specifications and will be sent to all bidders. Such addenda are to be listed in the bids, and in closing the contract they will become a part thereof. [See also Article E-45]

C-04. Bids. -

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

(b) All bids must be submitted on the same form as the specimen shown in Section B of the Specifications and must be signed. All blanks on the Bid Form must be filled in. Numbers shall be written in English words and in Arabic numerals, and the completed form shall be without interlineation, alteration or erasure. Failure to submit a bid in the form required or the inclusion of any condition, alternate, limitation or provision not called for will render the bid irregular and shall be considered sufficient cause for rejection of a bid. Failure to complete entries in all blanks in the Bid Form may be considered sufficient cause for rejection of a bid.

(c) Bids are to be addressed to the Owner, at the address and room number shown in the Invitation to Bid and must be inclosed in an opaque, sealed envelope and marked on the lower left corner with the Bid Date, Bid Time, Bid Number, Name of Project and identified with the words "Bid for Construction". Bids are to reach the address designated in the invitation to bid not later than the hour and date named in the invitation to bid. After that time no bids may be received.

(d) A bid must be submitted for all alternates. [See Article E-47]

(e) Bids together with the full bid security accompanying same 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. 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 law.

C-05. Bidder Qualifications. The Mechanical contractor or subcontractor shall have been in business for a minimum of ten (10) years under the current company name and shall have successfully completed ten (10) installations of the type and size (or larger) of the equipment specified herein on commercial projects.

C-06. Examination of Site. The bidder=s attention is directed to Article E-15(g).

C-07. Contract Form and Bonds. The bidder=s attention is directed to Article B-04.

C-08. Award. Award shall be made to the lowest responsive and responsible bidder. The lowest bid will be the bid whose price, after incorporating all accepted alternates, is the lowest and most responsive bid which was received. The OWNER reserves the right in its sole and complete discretion to reject any and all bids and to waive technicalities and informalities. [See Also Article C.01]

C-09. Surety and Insurance Companies. The contract provides that the surety and insurance companies must be acceptable to the Owner. To avoid inconvenience, only those surety=s listed in the Department of Treasury=s Listing of Approved Sureties (Department Circular 570) are acceptable to the Owner. [See also Articles E-27 and E-30]

C-10. Employment of Georgia Citizens and Use of Georgia Products. Since the work provided for in this contract is to be performed in Georgia, it is the wish 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. [See also Articles E-61, E-66]

C-11. Trade Names. The attention of bidders and all other parties is called to the procedure under Article E-03 of the general conditions for the submission of trade names, brand names, or names of manufacturers for approval. This procedure commonly known as an "or equal" provision. The successful bidder may furnish no products of any trade names, brand names, or manufacturers= names except those designated in the contract documents including published addenda.

END OF SECTION

SECTION D - SUPPLEMENTARY GENERAL CONDITIONS

D-01. Section E, General Conditions are amended / clarified as follows:

In the event of conflict, the Supplementary General Conditions (Section D) shall govern the General Conditions (Section E). See E-01 and E-49

D-02. Article E-1. Definitions.

a) Sub-paragraph (s), Owner, is further defined as follows:

1. The Owner as referred to herein is **Gordon College**.
2. The address of the Owner to which all correspondence regarding this Project should be addressed is:

Gordon College
Plant Operations
419 College Drive
Barnesville, Georgia 30204

b) Sub-paragraph (t), Architect is further defined as follows:

1. The Architect as referred to herein is : Andrews, Hammock and Powell, Inc.
2. Where the term AEngineer@ is used herein, it shall also mean the Architect.
3. The address of the architect to which all correspondence regarding this Project should be addressed is: 250 Charter Lane, Suite 100, Macon, GA 31210-4594

D-03. Article E-27. Indemnification, Insurance and Hazards.3

a) Add Sub-paragraph E-27(c)3(e)(4) to read as follows:

1. The combined Primary Liability and Excess Commercial Umbrella Liability Insurance minimum limits for any Contractors performing or subcontracting the performance of work under this contract on an existing state-owned building which has a total value of building and contents in excess of $ 3,000,000 (not to exceed $10,000,000) and which value is expressly stated hereinbelow and which involves the following construction operations

    a. Welding or acetylene torch cutting:
    b. Other work which the Owner specifies as potentially causing a catastrophic loss:

shall be no less than $ _____ per occurrence and $ _____ Aggregate.

b) **Exhibit F**

Exhibit F, Certificate of Insurance, Commercial Umbrella Liability shall be increased from $2,000,000 per occurrence to $ _____ per occurrence.

D-04. Notices. Prior to any shutdown of any system (road, sidewalk, electrical, mechanical, etc.), Contractor shall supply not less than five (5) working days notice to the to the Architect with a copy to the Owner. No shutdown of any system shall occur until the Contractor has received permission from the Owner in writing.

END OF SECTION

SECTION E

GENERAL CONDITIONS

Article E-01. General Conditions. The General Conditions of the Contract, Articles E-01 through E-71, inclusive, bound herein and hereafter referred to as the "General Conditions," shall govern in the event of any conflict with any other provisions of the contract documents unless notice to the contrary shall have been issued by the Owner bearing the imprimatur of the Owner as follows:

"By order of Gordon College, Owner".

In the event of conflict, the Supplementary General Conditions control is over the General Conditions, and the Contract control is over the Supplementary and General Conditions. [See D-01 and E-49] The Architect has no authority to amend the General Conditions orally or in writing either expressly or by implication.

Article E-02. Legal Compliance. The Contractor shall comply with all laws, rules, regulations, ordinances and orders of any government agency having jurisdiction in the performance of the work and shall ensure the compliance of his subcontractors. Without limiting the generality of the foregoing, the following laws are specifically referenced:

a) The Drug-Free Workplace Act, O. C. G. A. Section 50-24-1, *et. seq.* (See Article E-48)

b) Preference for Georgia Supplies, materials, equipment, and agricultural products, O. C. G. A. Sections 50-5-60 through 61. (See Article E-61)

c) Preference for Georgia forest products, O. C. G. A. Section 50-5-63. (See Article E-66)

d) Preference to local sellers of Georgia products, O. C. G. A. Section 50-5-62. (See Article E-61)

e) Standards and Requirements for Construction, Alterations, *etc.*, O. C. G. A. Section 8-2-1 *et. seq.*

f) Control of Soil Erosion and Sedimentation, O. C. G. A. Section 25-2-1, et. seq.

g) Regulation of Fire and other Hazards, O. C. G. A. Section 25-2-1 *et. seq.* (See Article 12(a))

h) Omitted

i) Omitted

j) Underground Gas Pipes, O. C. G. A. Section 25-9-1 *et. seq.* (See Article E-12(f)

k) High Voltage Safety Act, O. C. G. A. Section 46-3-30 *et. seq.* (See Article E-12(g))

l) Access and Use by Physically Handicapped Persons, O. C. G. A. Section 30-3-1 *et. seq.*

m) Small and Minority Business Enterprises, O. C. G. A. Sections 50-5-120 *et. seq.* and 50-5-130 *et. seq.*

n) Trading with the State or State Officials, O. C. G. A. Sections 45-10-20 to 45-10-71.

o) Title VII of the Civil Rights Act, 42 U.S.C. Section 2000a through 2000h-6

p) Age Discrimination in Employment Act, 29 U.S.C. Section 621 *et. seq.*; 42 U.S.C. Section 6101 *et. seq*

q) Americans with Disabilities Act, 42 U.S.C. Section 12101 *et. seq*.

r) Federal Occupational Safety and Health Act, 29 U. S. C. Section 651 *et. seq.* (See Article E-12(j)

Federal Emergency Planning and Community Right-to-Know Act, 42 U. S. C. Section 11001 *et. seq.*

(See Article E-12(k))

Unless otherwise provided in the Contract Documents, the Contractor shall pay all sales, consumer, use and all other applicable taxes which are legally enacted at the time bids are received.

Article E-03. Trade Names.

(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 which 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 Architect at least ten days prior to the date set for the opening of bids. The latter provision is a restriction which applies only to the party making a submittal. Therefore, the aforesaid restriction does not inhibit the Owner from adding trade names, brand names or names of manufacturers by addendum.

(b) *Request for Approval* - All requests for approval for substitution of a product not listed in the bid documents must be made to the architect in writing. In order for the Architect to prepare an addendum intelligently, an application for approval of a 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, which 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. [See Article E-43 which requires the Contractor to do all cutting and fitting that may be required to make the several parts of his work come together properly and fit] The application to the Architect for approval of a proposed 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 which the party requesting approval desires to submit in support of his application. The Architect will give consideration to 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 submittal is approved by the Architect, an addendum will be issued to all prospective bidders. Issuance of an addendum is a representation to all bidders that the Architect in the exercise of his professional discretion established that the product submitted for approval is acceptable and meets or exceeds all express requirements. In the event a submittal shall have been rejected by the Architect and there shall have been a request for a conference as provided in this article pursuant to which conference the said submittal shall have been found to comply with the requirements of this article, a separate 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 (REPEAT 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 Architect 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 five days prior to the date set for the opening of bids, time being of the essence.

Article E-04. Third Party Beneficiaries. Contractor acknowledges, stipulates and agrees that the owner is a public Commission performing an essential public and governable function by means of the Contract. Contractor acknowledges, stipulates and agrees that the Using Agency and the State of Georgia express third party beneficiaries of this contract. Failure of Contractor to comply with this Contract may cause general and special or consequential damages to Owner or to officers, agencies, commissions, departments, instrumentalities or other entities of the State of Georgia, which will occupy the completed work or which provide governmental services or supplies to them. By way of illustration and not limitation, breach or repudiation of the Contract may cause the need to crowd other premises, to extend occupancies of other premises or to occupy unsatisfactory premises. Contractor shall be liable for damages

under this Contract not only to Owner but also to, and as third party beneficiaries of its Contract, the Using Agency, the State of Georgia, or to any officer, agency, commission, department, instrumentality or entity of the State of Georgia, which is to occupy the work or which performs a governmental function for the same and whose costs or burden is increased by a breach in the Contract. This Contract contemplates general and special or consequential damages not only to Owner but to such third party beneficiaries. Liability to third party beneficiaries shall be without regard to whether Owner has breached any duty of its own to third party beneficiaries, and neither Contractor nor its surety shall have any right of subrogation against Owner or the State or other third party beneficiaries.

Article E-1. Definitions.

(a) *Contract Documents*- The contract documents are as described in the Form of Agreement, Article E-71 of the general conditions. [See Exhibit E for specimen of form of agreement]

(b) *Parties* -The Owner, the Contractor and the Architect are those mentioned as such in the form of agreement. They are treated throughout the contract documents as if each were of the singular number and masculine gender. Express third party beneficiaries are the Using Agency and the State of Georgia.

(c) *Subcontractor* - The term subcontractor as employed herein includes only those having direct contract with the Contractor. It includes one who furnishes materials worked to a special design according to the plans and specifications of this work but does not include one who merely furnished materials not so worked.

(d) *Notices* - Written notice shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered mail to the last business address known to him who gives the notice.

(e) *Work* - The term "work" of the Contractor or subcontractor includes labor or materials or both.

(f) *Time Limits* - All time limits stated in the contract documents or shown on the construction progress schedule are of the essence of the contract. [See also Article E-46]

(g) *Applicable Law* - This contract shall be governed by the law of Georgia.

(h) *Specifications* - The term "Specifications" shall include all written matter in the bound volume or on the drawings and any addenda or modifications thereto. [See Article E-49 concerning resolution of conflicts]

(i) *Order of Condemnation* - An order of condemnation shall be in writing, shall be dated, shall be signed by the Architect, shall be addressed to the Contractor with a copy to the Owner, and shall contain three elements as follows:

FIRST ELEMENT: Description of work . . .

(1) which has been omitted or
(2) which is unexecuted as of the date of the order of condemnation, the time for its incorporation into the work under the construction progress schedule having expired [See also Article E-46], or
(3) which has not been executed in accordance with the methods and materials designated in the contract documents.

SECOND ELEMENT: Citation of the provision or provisions of the contract documents which has or have been violated.

THIRD ELEMENT: Fixing of a reasonable space of time within which the Contractor shall have made good the deficiency which said space of time shall not be deemed to be an extension of contract time for filing the Notice of Readiness for Final Inspection pursuant to Article E-41 nor shall it be deemed to be authorization for amendment to the construction progress schedule. [See also Articles E-19, E-20, and E-50].

An order of condemnation may be issued for failure of the Contractor to supply enough workmen or enough materials or proper materials. The order of condemnation in such event may be based on Article E-46, and upon the definition of work as set forth under Article E-1(e). [See also Article E-26]

(j) *Proceed Order* - The proceed order is a written notice from the Owner pursuant to which the Contractor shall commence physical work on the site. [See Article E-46] A proceed order is a condition precedent to the execution of any work on the site by the Contractor.

k) *Work Order* - A work order is a written notice from the Owner issued separately to the Contractor for each subcontractor. A work order is a condition precedent to the execution of any work on the site by a subcontractor.

(l) *Change Order Form* - The change order form is the instrument by which adjustments in the contract sum are effected pursuant to changes made in accordance with Article E-15. The change order form shall be accompanied by a breakdown in the form prescribed in a specimen which the Owner will supply to any bidder upon request. The Architect shall certify to the amount of the adjustment. The change order form shall be signed by the Contractor and the Owner. The breakdown is only for the purpose of enabling the Architect and the Owner to make a judgment on the dollar amount of the adjustment in the contract sum. No condition, term, qualification, limitation, exception, exemption, modification, or proviso shall appear in the breakdown. The breakdown shall be in the exact form and language of the above-mentioned specimen. In the event any condition, term, qualification, limitation, exception, exemption, modification, or proviso shall appear in a breakdown it shall be invalid unless expressly recited in the change order form under Paragraph 3, "Description of Change". Only such conditions, terms, qualifications, limitations, exceptions, exemptions, modifications and provisos as are recited under Paragraph 3, "Description of Change", are valid. [See also Article E-15]

(m) *Install, Deliver, Furnish, Supply, Provide and Other Such Words* - Such words mean the work in question shall be put in place by the Contractor ready for use unless expressly provided to the contrary.

(n) *Article Not Plenary* - This article is not entire, plenary, or exhaustive of all terms used in the general conditions which require definition. There are definitions of other terms under articles to which the terms are related.

(o) *Grounds for Issuance of Notice of Declaration of Default* - It shall be a sufficient ground for the issuance of a notice of declaration of default that the Contractor has been unfaithful or delinquent in the performance of the contract or any part of it in any respect. Without limitation of the foregoing and without subtracting from any right or defense of the Owner under other provisions of the contract documents, the Contractor acknowledges and agrees that it is *ipso facto* ground for issuance of a notice of declaration of default under the performance bond if the Contractor shall have neglected or failed for any reason to remedy a breach of an order of condemnation within thirty (30) days after the Owner shall have given written notice of said breach to the Contractor and the surety on the performance bond with written demand of the Owner for curing of the delinquency. The Architect does not have authority to declare the Contractor in default.

(p) *Cross-reference and Citations of Articles and Paragraphs of the General Condition* - Cross-references and citations of articles and paragraphs of the general conditions are for the convenience of the Contractor, Architect and the Owner and are not intended to be plenary or exhaustive nor are they to be considered in interpreting the contract documents or any part of the contract documents.

(q) *Meaning of Words and Phrases* - Unless the context or the contract documents taken as a whole indicate to the contrary, words used in the contract documents that have usual and common meanings shall be given their usual and common meanings and words having technical or trade meanings shall be given their customary meaning in the subject business, trade or profession.

(r) *Shop Drawings* - Shop drawings are drawings, schedules, data, catalogue cuts, manufacturers' published recommendations, charts, bulletins, brochures, illustrations, circulars, roughing drawings or formulae distributed by Contractors, subcontractors, manufacturers, materialmen, or suppliers for use in installing work. [See also Article E-53]

(s) *Owner* - See Supplementary General Conditions, Section D.

(t) *Architect* - See Supplementary General Conditions, Section D.

(u) *Contractor* - The successful bidder who provides the lowest responsive bid and to whom a contract is awarded.

The Contractor will execute a contract based on the specimen found at Exhibit E.

Article E-2. Identification, Correlation, and Intent of Documents.-

(a) *Identification.*-The Architect shall regardless of any identification to the contrary, identify the contract documents. The contract documents shall in every case include the contract, as executed, the specifications, the General Conditions, the Supplementary General Conditions, and the bid document.

(b) *Correlation and Intent.*-The contract documents are complementary, and what is called for by one shall be as binding as if called for by all. The intention of the documents is to include all labor and materials, equipment, and transportation necessary for the proper execution of the work. It is not intended, however, that materials or work not covered by or properly inferable from any heading, branch, class or trade of the specifications shall be supplied unless distinctly noted on the drawings. Materials or work described in words which so applied have a well-known technical or trade meaning shall be held to refer to such recognized meanings. [See also Article E-9] In the event the Architect shall have used such phrases anywhere in the contract documents as: "Work indicated on the drawings and herein specified", "work shown and specified", "in accordance with drawings and specifications", "indicated on the drawings and specifications", "in accordance with specifications and applicable drawings", "these specifications and the accompanying drawings", "as indicated on the drawings and as specified herein", or similar expressions, they shall not be deemed to be and are not a defeasance of the provisions under the present article of the general conditions, and they are not to be construed as requiring work to be called for both in the specifications and in the drawings in order to be a requirement under the contract. Any of the aforesaid conjunctive expressions and phrases or any cross-reference between drawings and specifications, between specifications and specifications, or between drawings and drawings to the contrary notwithstanding, the contract documents are complementary, and what is called for by one shall be as binding as if called for by all. [See also Articles E-1(m), E-36, E-37, E-45, and E-49]

Article E-3. Complete, Definite, and Clear Instructions and Schedules of Drawings.-

(a) *Refinement of Documents.*-The Contractor shall do no work without complete, definite, and clear drawings and specifications. In the event the contract documents are not complete, definite, and clear the Contractor shall make demand upon the Architect in writing for additional instructions and shall furnish the Owner a copy of the aforesaid demand. With reasonable promptness the Architect shall furnish complete, definite, and clear instructions in writing, or by means of drawings, or in writing and by means of drawings. [See also Articles E-2, E-14, E-18, and E-39] Such additional instructions if given orally shall be confirmed in writing or by drawings or both within a reasonable space of time. Any such additional instructions shall be consistent with the contract documents, true developments thereof, and reasonably inferable therefrom. The work shall be executed in conformity with the aforesaid instructions. The Architect shall furnish the Owner a copy of all additional instructions issued to the Contractor. [See also Articles E-16 and E-39]

(b) *Schedules.*-The Contractor and the Architect shall jointly prepare a schedule, subject to change from time to time in accordance with the progress of the work, fixing the dates at which the various detail drawings will be required, and the Contractor shall furnish them in accordance with that schedule. [See also Article E-5(b)]

Article E-4. Copies of Contract Documents Furnished to Contractor.-The Architect shall furnish to the Contractor, free of charge, five (5) sets of contract documents. The Contractor shall obtain such additional sets of contract documents as the Contractor deems necessary and shall pay the cost of reproduction of such additional sets.

Article E-5. Shop Drawings.-

(a) *Submission and Approval.*-The Contractor shall submit no shop drawings which do not comply with the contract documents. The Contractor shall review all shop drawings prior to submission. He shall submit such reasonable number of shop drawings as shall be required by the Architect for the work of the various trades, and the Architect shall pass upon them, making proper corrections. The Contractor shall make any proper corrections required by the Architect, file with him two corrected copies, and furnish such other copies as may be needed. The Architect's approval of such drawings or schedules shall not relieve the Contractor from responsibility for deviations from drawings or specifications nor shall it relieve him from the responsibility for errors of any sort in shop drawings or schedules.

(b) *Schedule.*-The Contractor and the Architect shall jointly prepare a schedule, subject to change from time to time in accordance with the progress of the work, fixing the dates for submission of shop drawings by the Contractor and for furnishing of approval by the Architect. The Contractor shall submit in accordance with the schedule, and the Architect shall furnish approval in accordance with the schedule. The schedule must be consistent with the construction progress schedule required under Article E-50 of the general conditions.

Article E-6. Drawings and Specifications at the Site.-The Contractor shall keep at the site one copy of all drawings and specifications in good order with all addenda and change orders noted thereon and available to the Architect and to his representatives.

Article E-7. Ownership of Drawings and Models.-All drawings, specifications, and copies thereof furnished by the Architect are the property of the Owner. They are not to be used on other work, and with the exception of one set, are to be returned to the Architect on his request at the completion of the work. All models are the property of the Owner.

Article E-8. Samples.-The Contractor shall furnish for approval all samples as directed. The work shall be in accordance with approved samples.

Article E-9. Materials, Appliances, Employees.-

(a) *Payment for.*-Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation, and other utilities and facilities necessary for the execution and completion of the work. [See also Articles E-2 and E-70]

(b) *Quality of materials and workmanship.*-Unless otherwise specified, all materials shall be new, and both workmanship and materials shall be of good quality. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials and work. The burden of proof is on the Contractor.[See also Article E-13]

(c) *Quality and discipline of employees.*-The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him. [See also Article E-14]

Article E-10. Royalties and Patents.-The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for all such loss when a particular process or the product of a particular manufacturer or manufacturers is specified, but if the Contractor has information that the process or article specified is an infringement of a patent he shall be responsible for such loss unless he promptly gives such information to the Owner. [See also Article E-11]

Article E-11. Surveys, Permits and Regulations.-

(a) *General.*-The Owner shall furnish all surveys unless otherwise specified. Permits and licenses of a temporary nature necessary for the prosecution of the work shall be obtained and paid for by the Contractor. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be obtained and paid for by the Owner unless otherwise specified. The Contractor and sub-contractor must pay any municipal or county occupational licenses, taxes, or fees, if any. The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work. If the Contractor observes that the drawings or specifications are at variance therewith, he shall promptly notify the Owner in writing, and any necessary changes shall be adjusted as provided in the contract for changes in the work. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules or regulations without such notice to the Owner, he shall bear all costs arising therefrom. [See also Articles E-10 and E-42]

(b) *Codes*

1) Standard Building Code, Southern Edition.
2) Standard Mechanical Code
3) Standard Gas Code
4) Georgia State Plumbing Code
5) Georgia State Electrical Code
6) Georgia State Energy code for buildings.

The latest edition of the above listed codes with all amendments as of the date of the opening of bids shall govern the installation of all work and is adopted and incorporated into the contract documents and made a part thereof by reference, Provided, however: That the drawings and specifications shall be adhered to in all cases where they call for quality of materials, quality of workmanship, or quality of construction which is equal to or in excess of the quality required by the above state codes and Provided also: That there may be no variances from the drawings and specifications except to the extent that the said variances shall be necessary in order to comply with the above stated codes. It shall be the

responsibility of the Contractor to familiarize himself with the requirements of the above stated codes. If there are any express requirements in the drawings or specifications which are at variance to the above stated codes, all changes in the work necessary to eliminate the said requirements and make the work conform to the above stated codes shall be adjusted as provided in the contract for changes in the work.

(c) Asbestos - The Contractor shall not install any product or material that contains asbestos. If such is specified, Contractor shall inform the A/E and Owner and request specific instructions.

Article E-12. Protection of Work and Property.-

(a) *Duty to protect Property.*-The Contractor shall continuously maintain adequate protection of all his work from damage [See also Article E-24] and shall protect all other property from damage, injury, or loss arising in connection with the work regardless of who may be the owner of said property. He shall make good any such damage, injury, or loss except such as may be directly the result of errors in the contract documents or such as shall be caused directly by agents or employees of the Owner. [See also Article E-27]

(b) *Safety Precautions.*-The Contractor shall comply with the rules and regulations of OSHA and/or the Department of Labor (O. C. G. A. section 34-2-6), and, where not inconsistent with the foregoing, the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc., for safety and prevention of accidents, and shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work arising out of and in the course of employment on work under the contract. The Contractor alone shall be responsible for the safety, efficiency, and adequacy of his plant, appliances, and methods, and for any damage which may result from their improper construction, maintenance, or operations. He shall erect and properly maintain at all times as required by the conditions and progress of the work proper safeguards for the protection of workmen and the public and shall post danger warnings against any hazards created by the construction operations. He shall designate a responsible member of his organization on the work whose duty shall be the prevention of accidents. In the absence of notice to the contrary, filed with the Architect in writing with copy to the Owner, this person shall be the superintendent of the Contractor.[See also Article E-14]

(c) *Emergencies.*-In an emergency affecting the safety of life or the work or of adjoining property, the Contractor, without special instruction or authorization from the Architect or Owner, shall act, at his discretion, to prevent such threatened loss or injury. Any remuneration claimed by the Contractor on account of emergency work shall be determined in accordance with allowances permitted on force account under Case (c) of Article E-15 of the general conditions.

(d) *Blasting.*-In the absence of an express provision in the contract permitting blasting, there shall be no blasting. If blasting is permitted under the contract and under the law which is applicable to the premises [including but not limited to O. C. G. A. Sections 25-8-1 *et. seq.* and 25-9-1 *et. seq.*], such blasting shall in all events be done in such manner as to prevent all scattering. [See also Article E-27]

(e) *Rain Water, Surface Water, and Back-up.*-The Contractor shall protect all work, including but not limited to excavations and trenches, from rainwater, surface water, and back up of drains and sewers. The Contractor shall furnish all labor, pumps, shoring, inclosures, and equipment necessary to protect and to keep the work free of water. See E-02f).

(f) Omitted

(g) *High Voltage Act.*-The Contractor by signing the contract acknowledges that he is fully aware of the contents and requirements of O. C. G. A. Section 46-3-30 *et. seq.* and any amendments thereto, and Rules and Regulations of the Commissioner of Labor pursuant thereto (the preceding requirements being hereafter referred to as the "high voltage act"), and the Contractor shall comply therewith. The signing of the contract shall also confirm on behalf of the Contractor that he

(1) has visited the premises pursuant to Article E-15 (g) of the general conditions and has taken into consideration the location of all electric power lines on and adjacent to all areas onto which the contract documents require or permit the Contractor either to work, to store materials, or to stage operations, and

(2) that the Contractor has obtained from the Owner of the aforesaid electric power lines advice in writing as to the amount of voltage carried by the aforesaid lines.

The Contractor agrees that he is the "person or persons responsible for the work to be done" as referred to in the high voltage act and that accordingly the Contractor is solely "responsible for the completion of the safety measures which are required by Section 3 of the high voltage act before proceeding with any work . . ." The Contractor agrees that prior to the completion of precautionary measures required by the high voltage act he will neither bring nor permit the bringing of any equipment onto the site (or onto any area or areas onto which the contract documents require or permit the Contractor to work, to store materials, or to stage operations) with which it is possible to come within eight feet of any high voltage line as defined in the high voltage act, and the Contractor assumes complete and sole responsibility for any accident or accidents which may occur as a result of contact with a high voltage line or lines pursuant to operations arising out of performance of the contract. The foregoing provisions apply to power lines located (a) on the site and (b) on any area or areas onto which the contract documents require or permit the Contractor either to work, to store materials, or to stage operations, or (c) within working distance for equipment or materials being used on (a) and (b) above. These provisions of the contract do not limit or reduce the duty of the Contractor otherwise owed to the Owner, to other parties, or to both. The Contractor agrees that the foregoing provisions supplement Articles E-12 and E-27 of the general conditions. The Contractor agrees and acknowledges that any failure on his part to adhere to the high voltage act shall not only be a violation of law but shall also be a breach of contract and a specific violation of the provision under Article E-12 of the general conditions which pertains to safety precautions. The Contractor is notified that the Rules and Regulations promulgated by the Commissioner of Labor under date of January 11, 1967, contain a statement under Section 12 that ...

> "The Division of Inspection of the Department of Labor will act in an advisory capacity to any person, firm, or corporation contemplating any operations near high voltage lines as defined in the Act . . ."

(h) *Building Construction Safeguards.*-The Contractor acknowledges and agrees that he is the person responsible under the law and that he is the person EMPLOYING or directing others to perform labor within the meaning of O. C. G. A. Section 34-1-1 *et. seq.* He acknowledges and agrees likewise that he will comply with the aforesaid law.

(i) *Dust Control.* - Dust-proof enclosures or partitions for protection wherever dusty or dirty work is performed and dampening of debris to avoid dusting when removed shall be provided and included as a cost of the work.

(j) *Occupational Safety and Health Act.* - Contractor, by signing the contract, acknowledges that he is aware of and familiar with the contents and requirements of the Federal Occupational Safety and Health Act of 1970, 29 U. S. C. Section 651 *et. seq.*, as amended.

(k) *Emergency Planning and Community Right-to-Know Act.* - Contractor, by signing the contract, acknowledges that he is aware of and familiar with the contents and requirements of the Federal Emergency Planning and Community Right-to-Know Act, 42 U. S. C. Section 11001 *et. seq.*, as amended, and O.C.G.A. Section 45-22-2 *et. seq.*, does hereby certify that Contractor and its sub-contractor and trade contractor are in compliance with these laws.

(l) Fire Protection. -Contractor shall take adequate and reasonable precautions to protect work against damage by fire and smoke. For example, without limitation, Contractor shall:

a. Provide fire extinguishers in readily accessible locations;

b. Periodically inspect fire extinguishers, remove discharged extinguishers immediately and replace with new or recharged extinguishers;

c. Keep one fire extinguishers within five (5) feet of any welding or open flame operations;

d. Remove oil-soaked and paint-soaked materials, including paper and rags, from building daily, and more frequently as necessary, to eliminate danger of fire.

e. Not permit workmen to smoke during operations involving combustible adhesives, solvents, mastics, or other fire hazard materials.

Article E-13. Inspection of Work.-

(a) *Access to Work.*-The Architect and his representatives shall at all times have access to the work wherever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and for inspection. [See also Article E-9]

(b) *Notice to Architect from Contractor Prior to Covering Work.*-If the specifications, the Architect's instructions (either in the specifications or issued later in writing), laws, ordinances or any public authority require any work to be specially tested or approved, the Contractor shall give the Architect timely notice in writing of its readiness for inspection, and if the inspection is by any authority other than the Architect, of the date fixed for such inspection. [See also Article E-58] Inspections by the Architect shall be made promptly and where practicable at the source of supply. If any work should be covered without approval or consent of the Architect, it must, if required by the Architect, be uncovered for examination at the Contractor's expense. [See also Article E-58]

(c) *Re-examination or Re-testing of Work Covered pursuant to Consent of Architect.*-Re-examination or re-testing of questioned work covered pursuant to consent of the Architect may be ordered by the Architect, and if so ordered the work must be uncovered by the Contractor. If such work be found in accordance with the contract documents the Owner shall pay the cost of re-examination and replacement or of re-testing. If such work be found not in accordance with the contract documents the Contractor shall pay such cost unless he shall show that the defect in the work was caused by another Contractor, and in that event the Owner shall pay such cost. Re-examination or re-testing under the terms of Article E-13(c) applies only to work which has been covered with consent of the Architect. Work covered without consent of the Architect must be uncovered for examination as provided under Article E-13(b).

(d) *Inspection Does Not Relieve Contractor.*-Under the contract documents the Contractor has assumed the responsibility of furnishing all services, labor and materials for the entire work in accordance with such documents. No provisions of this article nor any inspection of the work by the Owner, representatives of the Owner, the Using Agency, resident engineer inspector, clerk-of-the-works, engineers employed by the Architect, representatives of the Architect, or the Architect shall in any way diminish, relieve, or alter said responsibility and undertaking of the Contractor; nor shall the omission of any of the foregoing to discover or to bring to the attention of the Contractor the existence of any work or materials injured or done not in accordance with said contract documents in any way diminish, relieve, or alter such obligation of the Contractor nor shall the aforesaid omission diminish or alter the rights or remedies of the Owner as set forth in the contract documents. The resident engineer inspector has no power to make decisions, to accept or reject work, or to consent to the covering of work. The resident engineer inspector owes no duty to the Contractor. [See also Articles E-38, E-41, and E-60]

(e) *False Start.*-In the event notice of readiness pursuant to Article E-13(b), above, shall have been issued prematurely by the Contractor, his action shall be deemed to be a "false start", and the Contractor shall be liable for the damage resulting from the aforesaid false start, including but not limited to the salary, professional fees, and travel and living expenses of the person or parties inconvenienced by the aforesaid false start. [See also Article E-41 for further example of "false start"]

Article E-14. Superintendence and Supervision by Contractor.-

(a) *Superintendent of Contractor.*-The Contractor shall keep on his work during its progress and until the final certificate has been executed by the Architect a competent superintendent and any necessary assistants, all satisfactory to the Architect. The superintendent shall not be changed except with the consent of the Architect unless the superintendent proves to be unsatisfactory to the Contractor and ceases to be in his employ. The superintendent shall represent the Contractor in his absence, and all directions given to the superintendent shall be as binding as if given to the Contractor. [See also Articles E-9, E-12, E-15(c) and E-60]

(b) *Supervision by Contractor.*-The Contractor shall give efficient supervision to the work, using his best skill and attention. He shall carefully study and compare all drawings, specifications, and instructions and shall at once report to the Architect any error, inconsistency, or omission which he may discover, but he shall not be held responsible for their existence or discovery. [See also Articles E-3, E-40, and E-41]

Article E-15. Changes in the Work.-

(a) *Owner's Right to Make Changes.*-The Owner without invalidating the contract may in writing authorize or order extra work or may authorize or order changes by altering, adding to, or deducting from the work, the contract sum being adjusted accordingly. The Contractor hereby expressly agrees that the Contractor shall have no right to a claim for damages or extended overhead because of changes made by the owner. Such work is hereinafter designated "change" or "changes". All such changes shall be performed under the conditions of the original contract except that any claim for extension of time caused thereby shall be adjusted at the time of signing of the change order form. [See Article E-1 for definition of the change order form]

(b) *Cost to Owner for Changes.*-The cost to the Owner of any change shall be determined in one or more of the following ways:

CASE (a) By estimate and acceptance in a lump sum.

CASE(b) By unit prices named in the contract or subsequently agreed upon. Unit prices are net including overhead and profit. Neither establishment of unit prices in the contract nor later agreement to unit prices shall entitle the Contractor to execute any change under Case (b) prior to issuance of an authorization or order of the Owner in writing.

CASE (c) By force account, which is defined as expenditures allowed under Article E-15(h) plus a percentage or percentages as stated under Article E-15(h).

(c) *Changes Forbidden without Consent of Owner.*-Neither the Architect nor the Contractor shall make any change whatsoever in the work without authorization or order of the Owner in writing except in emergency as described hereinbelow. The making of any change without authorization or order of the Owner in writing is a breach of contract except in emergency as referred to under Article E-12. In the absence of authorization or order of the Owner given in advance in writing (except in emergency as referred to under Article E-12) the Contractor shall have no claim for payment, repayment, reimbursement, remittance, remuneration, compensation, profit, cost, overhead, expense, loss, expenditure, allowance, charge, demand, hire, wages, salary, tax, cash, assessment, price, money, bill, statement, dues, recovery, restitution, benefit, recoupment, exaction, injury, damages or time based upon or resulting from any change. [See also Articles E-53 and E-60]

(d) *Notice of demand of Contractor for extraordinary remuneration or for damages.*-For a change in the work the Contractor shall be entitled to no claim other than or in excess of allowances permitted under Article E-15(h) unless prior to commencement of execution of the change (a) the Contractor shall have notified the Owner in writing of the nature of the claim and (b) the Owner shall have agreed in writing to the claim. Commencement of execution of a change authorized by the Owner in the absence of the aforesaid written notice from the Contractor and written agreement to the claim by the Owner shall be deemed to be and is conclusive proof that the Contractor acknowledges that he makes no claim other than or in excess of allowances permitted under Article E-15(h).

(e) Omitted

(f) Omitted

(g) *Existing Conditions.*-The Contractor in undertaking the work under this contract is assumed to have visited the premises and to have taken into consideration all conditions which might affect his work. No consideration will be given any claim based on lack of knowledge of existing conditions except where existing conditions are such as cannot be readily ascertained. Any claims relating to conditions which were not readily ascertainable shall be adjusted as provided in the contract for changes in the work.

(h) *Cost to Owner, Allowances for Contractor, and Allowable Expenditures.*-In Cases (a) and (c), the "allowance for overhead and profit" combined, included in the total cost to the Owner, shall be based upon the following schedule:

(1) For the Contractor an allowance for work which he performs with his own forces, not to exceed 20% of his "net additional allowable expenditures", if any, for changes.

(2) For a subcontractor an allowance for work which he performs with his own forces, not to exceed 20% of his "net additional allowable expenditures", if any, for changes. A subcontractor shall receive no allowance for overhead and profit on work not performed by his own forces. Under this contract, the forces of a subcontractor of a subcontractor are deemed to be and are the forces of the subcontractor. [See also Articles E-36 and E-37]

(3) For the Contractor an allowance for work performed by his subcontractor, not to exceed 7-1/2% of the amount, if any, due the subcontractor for changes.

The above percentages shall be applied to the "net additional allowable expenditures", if any, as limited and defined herein. If the net difference between "allowable expenditures" and savings results in a decrease in expenditures, the amount of credit allowed the Owner shall be the net decrease without any credit for profit and overhead. "Net additional

allowable expenditures" as used herein shall mean the difference between all "allowable expenditures" and savings. The term "allowable expenditures" is limited to and defined as items of labor or materials, the use of heavy construction equipment [such as scrapers, backhoes, excavators, bulldozers, draglines, motor graders, and like equipment], and all such items of cost as public liability and worker's compensation insurance, social security and old age and unemployment insurance, and (in cases where there is an extension of time) *pro rata* expenditures for time of foremen employed in the direct superintendence of productive labor in execution of changes. All expenditures not included in the term "allowable expenditures" as limited and defined in this article shall be considered as overhead, including, but not limited to, insurance other than that which is mentioned in this article, bond premiums, supervision, travel (meals, transportation, and lodging), superintendence [except *pro rata* time of foremen as referred to herein], timekeepers, clerks, watchmen, hand tools, small tools, incidental job burdens, engineering, drafting, and office expense. Any other provisions in the contract documents to the contrary notwithstanding, only demonstrable, direct, out-of-pocket expenditures for the changes plus percentages as set forth hereinabove shall be allowable for changes. No wages of a foreman shall be allowable for a change carried on concurrently with contract work unless the claim includes a demand for extension of time caused by the authorizing or ordering of the change.

(i) *Execution of Changes Pursuant to Order.*-In the event neither Case (a), nor Case (b) can be mutually agreed upon as the method of determining the cost to the Owner for a change, the Contractor, provided he receives a written order from the Owner, shall proceed on force account under Case (c), and he shall keep and present in such form as the Architect may direct a correct account of the expenditures together with vouchers. Allowable expenditures shall in no event exceed current costs for like services and materials, the burden of proof being on the Contractor.

(j) *Stipulated Maximum Sum.*-Under Case (b) and Case (c), the Owner shall prescribe the limits of any authorization or order for a change by means of an authorization or order in writing stipulating the maximum sum of money committed toward execution of the said change, and the Contractor shall have no authority to perform any change which will cost the Owner in excess of the stipulated maximum sum. It shall be solely the Contractor's responsibility to apply in writing to the Owner, NOT [repeat NOT] to the Architect, for an enlargement of the scope of the authorization or order by an increase in the said stipulated maximum sum if during the course of the performance of a change on force account under Case (c) the additional cost of the change to the Owner as established in accordance with allowable expenditures and allowances for profit and overhead permitted under Article E-15(h) is approaching the said stipulated maximum sum. It shall likewise be the responsibility of the Contractor to apply for an enlargement of the scope of the authorization or order if the total value of units at any agreed unit price under Case (b) is approaching the said stipulated maximum sum. For changes in the work no claim for payment, repayment, reimbursement, remittance, remuneration, compensation, profit, cost, overhead, expense, loss, expenditure, allowance, charge, demand, hire, wages, salary, tax, cash, assessment, price, money, bill, statement, dues, recovery, restitution, benefit, recoupment, exaction, injury or damages shall lie against the Owner for any amount in excess of such amount as shall have been mutually agreed to under Case (a) or in excess of such amount as shall have been established as the stipulated maximum sum under Case (b) or Case (c). The cost to the Owner for any change in the work, except a change based upon agreed unit prices under Case (b), shall be established in accordance with the schedule of allowances and percentages stipulated under Article E-15(h).

(k) *Breakdown of Expenditures, Cases (a) and (c).*-To accompany all change orders, the Contractor shall furnish a breakdown of expenditures for labor and materials by units and quantities in the form prescribed by the Owner, and the breakdown shall be accompanied by the following declaration. "I do solemnly swear, under criminal penalty of a felony for false statement subject to punishment by not less than one year nor more than twenty years of penal servitude, that the costs shown hereinabove do not exceed current costs for like services or materials and do not exceed the actual costs to the Contractor therefor; and that the quantities shown do not exceed actual requirements". For all force account changes the Contractor shall promptly and in no event later than thirty (30) days after receipt of written demand therefor pursuant to Article E-15(h) submit to the Architect a complete, accurate, and final breakdown and account together with vouchers, showing all expenditures and percentages allowable under Case (c). For all unit price changes the Contractor shall promptly and in no event later than thirty (30) days after receipt of written demand therefor pursuant to Article E-15(h) submit to the Architect an accurate account of the quantity of work performed under Case (b). In any case, the Architect shall certify to the amount [including under Case (a) and Case (c) the allowance prescribed in the contract for overhead and profit] due the Contractor. [See also Articles E-1(1) and E-50] The Contractor shall obtain and furnish as back up to the Contractor's breakdown a separate breakdown for each subcontractor's charges prepared by each subcontractor on the letterhead of the subcontractor and properly signed by the subcontractor.

(l) *Payment on Account.*-If the Contractor desires to obtain payment on account before any change in the work

has been completed, a change order certified by the Architect and signed by the Contractor and the Owner must have been executed for so much of the change as has been completed at the time of the filing of the request for payment on account.

(m) *Form and Execution of Change Orders.*-

(1) Change orders shall be certified by the Architect and signed by the Contractor and the Owner in accordance with the form of change order prescribed by the Owner. No request for payment of the Contractor for account of a change shall be due nor shall any such request appear on a periodical estimate or demand for final payment until (1) the change order shall have been certified by the Architect and (2) a change order shall have been executed by the Contractor and the Owner. [See also Article E-1(1)]

(2) All change orders are issued under the following condition and shall contain the following language:

The payment and extension of time (if any) provided by this change order constitutes compensation in full on behalf of the contractor and its subcontractors and suppliers for all costs and markups directly and indirectly attributable to the change order herein, for all delays related thereto and for performance of changes within the time stated.

(n) *Time of Submission of Claims ["Statement of Claim"].*-Budgeting and cash flow being of material importance to the Owner, no claim of the Contractor on account of any change or on account of any alleged negligence of the Architect or Owner, whether said claim shall be accrued or prospective, shall be valid unless a "statement of claim" in full accompanied by vouchers and other supporting data shall have been filed with the Owner by the Contractor not later than thirty (30) days after the facts giving rise to the claim first occurred, time being of the essence. The "statement of claim" shall contain a concise and clear recital of the ground or grounds on the basis of which the claim is asserted, including a designation of the provision or provisions of the contract documents on which the claim is based. The statement of claim shall indicate the dollar amount of the claim.

(o) *Claims distinguished.*- Claims for damages arising out of alleged negligence of the Architect or owner as provided for under Article E-16 are distinguished from claims for allowances for changes as provided for under Article E-15. Claims for damages must be filed entirely separately pursuant to Article E-16, and claims for allowances for changes must be filed entirely separately pursuant to Article E-15 unless the Contractor and owner agree in writing otherwise. [See also Article E-39(c)]

(p) *Conditions Different from Those Indicated in Contract Documents.*-The parties contemplate delays necessary to complete tests, to redesign, and to perform change order work in the event conditions encountered at the site are different from those indicated in the contract documents or to perform change order work to correct errors in the plans and specifications. Execution of any change must be authorized. In such event there shall be an adjustment in the contract sum as provided in the contract for changes in the work, but no claim for damages shall lie against the owner for the aforesaid delays. Such delays are not a breach of contract because the parties contemplate such delays as a natural and probable consequence of construction operations. The parties agree that such delays constitute no wrong or injury, create no right to a claim for damages, and are not a ground for claiming extraordinary remuneration.

(q) *Rental Rates and Wage Rates.*-Within five (5) days after execution of the form of agreement and in any event prior to the commencement of any work on the site the Contractor shall submit in accordance with the style and format of a specimen to be furnished by the Owner for consideration of the Owner (1) a proposal for rental rates on heavy construction equipment which shall apply in the event work is performed under Case (c) of Article E-15 and (2) a proposal for wage rates of operating engineers which shall apply in the event of the execution of any work under Case (c) of Article E-15. Under penalty of false swearing a principal of the contracting firm shall certify that the proposal for rental rates and proposal for wage rates do not exceed current costs for like services. The Owner will in no event consider a rental rate in excess of 80% of the rate set forth in the latest edition of the "Compilation of Nationally Averaged Rental Rates for Construction Equipment" of the Associated Equipment Distributors unless the rates proposed in excess of 80% are supported by proof satisfactory to the Owner that the excess rates are reasonable, the decision of the Owner to be final, binding and conclusive on all parties. Rental rates shall be payable only for the actual time the equipment is required on the site in the reasonable opinion of the Architect whose decision in this respect shall be final, binding and conclusive on all parties.

(r) *Unit Prices.*- The term "net" as used in reference to "unit prices" means in respect to change orders performed

in accordance with Case (b) of Article E-15 of the general conditions that the unit prices offered by the Contractor and accepted by the Owner shall be inclusive of all sums for payment, repayment, reimbursement, remittance, remuneration, compensation, profit, cost, overhead, expense, loss, expenditure, allowance, charge, demand, hire, wages, salary, tax, cash, assessment, price, money, bill, statement, dues, recovery, restitution, benefit, recoupment, exaction, or injury. Upon request of the Owner in writing and within such reasonable space of time as the Owner shall designate in writing the Contractor shall submit for consideration of the Owner proposals in writing for unit prices to be applied in the event work is authorized by the Owner to be performed under Case (b) of Article E-15. Under penalty of false swearing a principal of the contracting firm shall certify that the unit prices submitted do not exceed current costs for like services or materials.

Article E-16. Claims.-

(a) *Limited Basis; Protest.*-If the Contractor maintains that any instructions by drawings or otherwise involve extra cost to the Owner under this contract, he shall give the Owner and the Architect written notice thereof within a reasonable time after the receipt of such instructions, and in any event before proceeding to execute any change except in emergency endangering life or property. The allowances to the Contractor shall then be as provided under Article E-15. No claim for extra cost shall be valid unless so made. [See Article E-18 for claims relating to delay.]

(b) *Protest.*-All references to arbitration are deleted from the contract documents. Decisions of the Architect shall be rendered in all cases as provided for under the general conditions of the contract, but no decision of the Architect shall deprive the Owner or the Contractor of any form of redress which may be available under the laws of the State of Georgia to contracting parties. Any decision of the Architect shall be final and binding on the Contractor in the absence of written notice of protest from the Contractor received by the Owner by registered mail within twelve days of the date of the decision of the Architect [See also Articles E-3 and E-39]. The Owner shall have twelve days from the date of receipt of a protest within which to investigate and make a reply. There is no provision under the contract for execution of work "under protest". A protest must contain (1) the date of the decision of the Architect to which exception is taken, (2) a statement of the issue or issues, (3) a citation of the provision or provisions of the contract documents which govern the issue or issues, (4) a summary of the logical principle or principles on which the protest is based, and (5) a summary of the legal grounds for taking exception.

(c) *Shall be Based on the Legal Assertions of the Contractor.*-The Contractor shall assert claims solely on the basis of (a) principles of logic and (b) principles of law to which the Contractor, himself, prescribed. He shall not protest a decision or request a conference on the ground merely that a subcontractor, materialmen, or supplier has protested to the general contractor. Accordingly, the Contractor shall file no claim nor shall he make a request for a conference with the Owner regarding a claim except as it shall be for the purpose of asserting in the exercise of the Contractor's best judgment such views, requests, and legal propositions as he deems the Contractor is entitled to maintain independently of any right of any subcontractor, materialmen, or supplier against the general contractor. [See also Article E-36]

(d) *Conference with the Owner.*-

(l) *Effect of.*-The Owner has no legal obligation to confer orally with the Contractor about the terms of the contract or its performance and may insist that all transactions and all intercourse shall be in writing. Agreement of the Owner to confer with a Contractor shall not be construed as an offer of the Owner to reconsider or alter the Owner's policies, practices, procedures, or prior position, nor shall such agreement constitute a waiver of any right or defense of the Owner. Such a conference is without prejudice to any rights or defense of the Owner. After the conference there will be nothing to confirm since the Owner does not engage itself to do or not to do a thing by agreeing to confer with the Contractor. It is expressly agreed that no conference between the Contractor and the Owner shall cure any failure of the Contractor to give any notice nor shall it cure any breach of any time limit or revive any right in the contract.

(2) *Conditions precedent to.*-A proposal from the Contractor for a conference in respect to (a) a dispute, (b) a controversy, or (c) an interpretation or construction of any provision of the contract documents shall contain (a) a statement of the issue or issues, (b) a citation of the provisions of the contract documents which govern the issue or issues, (c) a precise summary of the logical principle or principles on which the issue or issues are based, and (d) a summary of the legal grounds which the Contractor takes with respect to the issue or issues.

(3) *Basis for and Terms of.*-All conferences between the Owner and the Contractor shall be pursuant to,

under the terms of, and in accordance with this article of the general conditions.

(e) *Continuation* - Pending final resolution of a claim, unless otherwise agreed, each party shall proceed diligently with performance of the contract and the work to which it is bound.

(f) *Litigation* - No action may be brought with respect to any claim except in accordance with this Article.

Article E-17. Deductions for Uncorrected Work.-If the Architect and Owner deem it inexpedient to correct work injured or done not in accordance with the contract, an equitable deduction from the contract price shall be made therefor; but there is no duty on the part of the Owner to accept any work injured or done not in accordance with the methods and materials designated in the contract documents, nor does the Contractor have the right to demand that there shall be acceptance of work injured or done not in accordance with the methods and materials designated in the contract documents.

Article E-18. Delay and Extensions of Time.-

(a) *Grounds.*-If the Contractor be delayed at any time in the progress of the work by any act or neglect of the Owner or the Architect, or of any employee of either, or by any separate Contractor employed by the Owner, or by changes ordered in the work, or by strikes, lockouts, pickets, inclement weather, unforeseeable subsurface conditions, fire, unusual delay in transportation, unavoidable casualties, or any causes beyond the Contractor's control, or by any cause which the Architect shall decide to justify the delay, then the time of completion shall be extended for such reasonable time as the Architect may decide. The Contractor expressly agrees that the Contractor's sole remedy for such delay shall be an extension of contract time and that the Contractor shall make no demand for damages or extended overhead. [See also Article E-15(p)].

(b) *Filing of Claim.*-No such extension shall be made for any delay occurring more than ten (10) days before claim thereof is filed in writing with the Architect with copy to the Owner. In the case of a continuing cause of delay, only one claim is necessary, but no claim for a continuing delay shall be valid unless the Contractor, within ten days from the cessation of the delay, shall have given notice in writing to the Architect, with copy to the Owner, as to the amount of additional time claimed.

(c) *Delay in Furnishing Drawings.*-[See also Article E-5] If no schedule or agreement stating the dates upon which drawings or approval of shop drawings shall be furnished is made, then no claim for delay shall be allowed on account of failure of the Architect to furnish drawings or approval of shop drawings until two weeks after demand thereof and not then unless such claim be reasonable.

(d) *Inclement Weather Defined* - The term "inclement weather" as used in these General Conditions is defined to mean weather which is substantially abnormal and inconsistent with what normally occurs at the project site during the time period in which the work is performed. No extension of time shall be allowed for normal periods of precipitation or for temperatures within the normal range for the time period.

(e) *Damages* - The contractor expressly agrees that the contractor's sole remedy for delays that are not the fault of the contractor, pursuant to this Article shall be an extension of contract time and that the contractor shall make no demand for damages or extended overhead as a result thereof. Without limiting the foregoing, except as otherwise provided in Articles E-15, E-16, and E-22, the contractor shall not be entitled to payment or compensation of any kind from the Owner for direct, indirect or impact damages because of hindrance or delay, whether reasonable or unreasonable, foreseeable or unforeseeable, avoidable or unavoidable; provided, however, that this provision shall not preclude recovery by the contractor of damages for hindrances or delays due solely to the negligence, fraud or bad faith on the part of the Owner. [See also Articles E-1, E-3, E-14, E-26, E-36, E-46, and E-50]

(f) *Owner's Damages* - The contractor expressly agrees that the Owner may make a claim as a result of delay not the fault of Owner for all reasonable losses actually incurred by Owner or the Using Agency, whether direct or indirect, due to the negligence, omissions or inadequate planning of contractor or contractor's agents or subcontractors, which are incurred as a result of the work not being completed and beneficial occupancy of the site not being obtained by the required Contract or contract completion date.

Article E-19. Correction of Work before Final Payment.-

(a) *Orders of Condemnation.*-The Contractor shall remove from the premises within the space of time designated in orders of condemnation all work condemned by the Architect as failing to conform to the contract, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute the work in accordance with the contract and without expense to the Owner and shall bear the expense of making good all work of other Contractors destroyed by such removal or replacement. The Contractor shall supply any omitted work and perform all unexecuted work within the space of time fixed by the Architect in orders of condemnation. [See also Article E-1(i)]

(b) *Remedy of the Owner for Breach of Order of Condemnation.*-If the Contractor does not make good a deficiency within a reasonable space of time fixed in an order of condemnation, the Owner may-

(1) Remove the condemned work and store it at the expense of the Contractor. If the Contractor does not pay the expenses of such removal and storing within ten days after receipt of written demand of the Owner, the Owner may upon three days' notice in writing to the Contractor sell such materials at private sale or at auction and shall account for the net proceeds thereof after deducting all proper costs incurred by the Owner, and

(2) Supply omitted work, perform unexecuted work, replace and re-execute work not done in accordance with the methods and materials designated in the contract documents and deduct the cost thereof from any payment then or thereafter due the Contractor, Provided: That the Architect shall approve the amount charged to the Contractor. [See also Article E-21]

The remedies stated in this article are in addition to the remedies otherwise available to the Owner, do not exclude such other remedies, and are without prejudice to any other remedies. Time limits stated in orders of condemnation are of the essence of the contract. Unless otherwise agreed to by the Owner in writing, the making good of condemned work shall physically commence at the site in not more than seven days after receipt of the order of condemnation except that in case of emergency correction shall physically commence at the site at once and except that the Contractor shall in any event physically commence the correction at the site early enough to complete within the space of time allowed in the order of condemnation. The Owner shall give prompt consideration to reasonable requests for delay in commencement of the making good of orders of condemnation. The making good of condemned work shall be completed within the space of time allowed in the order of condemnation unless the Contractor shall have requested from the Architect an increase in the amount of time allowed and the Architect shall have given notice to the Contractor in writing, with copy to the Owner, stating the additional amount of time, if any, allowed.

(c) *Notice of Correction from Contractor.*-The Contractor shall give prompt notice in writing to the Architect, with copy to the Owner, upon completion of the correction of any work, the supplying of any omission of any work or materials or the performance of any unexecuted work condemned by the Architect. [See also Article E-1] In the absence of such notice, it shall be and is presumed under this contract that there has been no correction, supplying remedy, or performance of unexecuted work.

Article E-20. Correction of Work after Final Payment.-

(a) Non-conforming or defective work - Neither (1) the final certificate, (2) nor any decision of the Architect, (3) nor payment, (4) nor any provision in the contract shall relieve the Contractor of responsibility for faulty materials, faulty workmanship, or omission of contract work, and he shall remedy any defects or supply any omissions resulting therefrom and pay for any damage to other work resulting therefrom. The Owner shall give notice of observed defects or omissions with reasonable promptness. The Contractor shall within the space of time designated in orders of condemnation and without expense to the Owner, correct, remedy, replace, re-execute, supply omitted work, or remove from the premises all work condemned by the Architect. The Contractor shall give prompt notice in writing to the Architect, with copy to the Owner, upon completion of the supplying of any omitted work or the correction of any work condemned by the Architect. In the absence of said notice, it shall be and is presumed under this contract that there has been no correction of the condemned work or supplying of omitted work. If the Contractor does not remove, make good the deficiency, correct, or remedy faulty work, or supply any omitted work within the space of time designated in orders of condemnation without expense to the Owner, the Owner, after ten days' notice in writing to the Contractor, may remove the work, correct the work, remedy the work or supply omitted work at the expense of the Contractor. In case of emergency involving health, safety of property, or safety of life the Owner may proceed at once. Correction of defective work executed under the plans and specifications or supplying of omitted work whether or not

covered by warranty of a subcontractor or materialmen, remains the primary, direct responsibility of the Contractor. The foregoing obligation of the Contractor shall remain in effect until the same shall have been extinguished by operation of the statute of limitations.

(b) *Warranty* - As additional security for the fulfillment of such obligation, but in no way limiting the same, the Contractor warrants and guarantees (1) that all work executed under the plans and specifications shall be free from defects of materials or workmanship for a period of one year from the date of the final certificate of the Architect, and (2) that for not less than one year from the date of the final certificate of the Architect, or for such greater space of time as may have been designated in the specifications, products of manufacturers shall be free from defects of materials and workmanship. Whenever written guaranties or warranties are called for, the Contractor shall furnish the aforesaid for such period of time as may be stipulated. The aforesaid instruments shall be in such form as to permit direct enforcement by the Owner against any subcontractor, materialmen, or manufacturer whose guaranty or warranty is called for, and the Contractor agrees that . . .

(a) The Contractor is jointly and severally liable with such subcontractors, materialmen, or manufacturers.

(b) The said subcontractors, materialmen, or manufacturers are agents of the Contractor for purposes of performance under this article, and the Contractor, as principal, ratifies the warranties or guaranties of his aforesaid agents by the filing of the aforesaid instruments with the Owner. The Contractor as principal is liable for the acts or omissions of his agents.

(c) Service of notice on the Contractor that there has been breach of any warranty or guaranty will be sufficient to invoke the terms of the instrument, Provided: That the Owner shall have furnished the Contractor with a copy of notice served on the subcontractor, materialmen, or manufacturer.

(d) The Contractor will bind his subcontractor, materialmen, and manufacturers to the terms of this article.

The calling for or the furnishing of written warranties shall in no way limit the contractual obligation of the Contractor as set forth hereinabove. The remedies stated in this article are in addition to the remedies otherwise available to the Owner, do not exclude such other remedies, and are without prejudice to any other remedies. [See also Article E-1(i), E-25, and E-60]

(c) Complaint items - In light of the above stated Contractor's warranty and guarantee, during the one year period of the warranty and guarantee any defects of material or workmanship that become apparent shall be the responsibility of the Contractor until and unless the Contractor can show abuse or design defect. The Contractor shall immediately correct all defects that become known during the one year period at no cost to the Owner unless notice is given to the Architect prior to correcting the defect that the cause of the defect is the result of abuse or design deficiency. When the Contractor is notified by the owner or Architect of a defect, the Contractor will visit the site to review the complaint. If it is the Contractor's responsibility, it will be immediately corrected. If the Contractor alleges design defect or abuse, he will notify the Architect and the Architect will issue a formal decision in his capacity as Architect and impartial interpreter of the conditions of the contract. If the condition is an emergency, this will be communicated to the Contractor with the request that no matter what he finds, corrections are to be accomplished immediately. If it is determined the complaint is not the responsibility of the Contractor, the Contractor will be paid immediately for the cost of the service call. The Contractor shall respond to a notice of defect within three (3) days except when classified as an emergency, in which case the Contractor's response time shall be limited to 24 hours. If the Contractor fails to respond within these time limits, the Owner may correct the defect and charge the Contractor for the work. The Contractor shall give notice in writing to the owner when corrections have been completed.

(d) *Notification of Using Agency of Site Visits*. Following the final inspection the contractor shall make no visits to the site without first giving notice to the Using Agency.

Article E-21.-The Owner's Right to Do Work -If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this contract, the Owner, after three days' written notice to the Contractor may without prejudice to any other remedy he may have (including without limitation remedies against the Contractor's surety), make good the deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor. Provided: However, that the Architect shall approve the amount charged to the Contractor. [See also Articles E-19(b)(2) and E-22]

Article E-22. Right of the Owner to Terminate Contract -

(a) *Termination for Convenience.* The owner may at any time, and for any reason or without any reason or cause, terminate this contract by written notice to the contractor specifying the termination date which shall be effective within seven days from the date to be stated by the owner in the notice to the contractor except that in the event of termination under this provision the owner shall pay to the contractor any fee properly due (i) for work already properly performed prior to the effective date of the termination and (ii) for any reimbursable expenses properly incurred. In the event of such termination the contractor shall have no claim in excess of what is allowed in this Article E-22 for any sum of money, however denominated, as a result of or relating to such termination.

(b) *Termination for Cause.* In the event that any of the provisions of this contract are violated by the Contractor or by any of his subcontractors, the Owner may serve written notice upon the Contractor and the surety of the Owner's intention to declare default and terminate the Contractor such notices to contain the reasons for such intention to terminate the contract, and unless within ten (7) days after the serving of such notice upon the Contractor, such violation or delay shall cease and satisfactory arrangement of correction be made, the contract shall, upon the expiration of said ten (10) days, cease and terminate. In the event of any such termination the Owner shall immediately serve notice thereof upon the surety and the Contractor, and the surety shall have the right to take over and perform the contract; Provided, however, that if the surety does not commence performance thereof within ten (25) days from the date of the mailing to such surety of notice of termination, the Owner may take over the work and prosecute the same to completion by contract or by force account for the account and at the expense of the Contractor and the Contractor and his surety shall be liable to the Owner for any excess cost occasioned the Owner thereby, and in such event the Owner may take possession of and utilize in completing the work such materials, appliances, and plant as may be on the site of the work and necessary thereof. [See Article E-15 for description of "force account"] [See also Article E-1(o); E-26]

Article E-23. Contractor's Right to Stop Work or Terminate Contract.-If the work should be stopped under an order of any court or other superior public authority for a period of ninety (90) days through no act or fault of the Contractor or by anyone employed by him, or if the Architect should fail to issue any certificate for payment within fourteen days after it is due, or if the Owner should fail to pay the Contractor within fourteen days of its maturity and presentation any sum certified by the Architect, then the Contractor may, upon seven days written notice to the Owner and the Architect, stop work or terminate this contract and recover from the Owner payment for all work executed and any loss sustained upon any plant or materials and reasonable profit and damages.

Article E-24. Application for Payments.-

(a) *Periodical Estimates and Receipts.*-The Contractor shall submit to the Architect in accordance with a form to be supplied by the Owner [specimen of which will be supplied to any bidder on request] an application [sometimes herein designated "periodical estimate"] for each payment, and, if requested by the Owner or Architect, receipts or other vouchers, showing his payments for materials and labor, including payments to subcontractors as required by Article E-37. [See also Articles E-32 and E-50]

(b) *Initial Breakdown and Periodical Payments.*-If payments are made on valuation of work done, such application shall be submitted at least ten days before each payment falls due, and the Contractor shall, before the first application, submit to the Architect a schedule of values of the various parts of the work, including quantities, aggregating the total sum of the contract, divided in such manner as to facilitate payments to subcontractors in accordance with Article E-37, on a form to be furnished by the Owner with a complete breakdown of the contract price so arranged and so itemized as to meet the approval of the Architect and, if requested, supported by such evidence as to its correctness as the Architect may direct. The schedule, designated herein the "initial breakdown" [specimen of which will be supplied to any bidder on request], when approved by the Architect shall be used as a basis for certificates of payment, unless it be found to be in error. In applying for payments, the Contractor shall submit a statement based upon this schedule on a periodical estimate form to be supplied by the Owner [specimen of which will be supplied to any bidder], and, if requested by the Architect or Owner, itemized in such form and supported by such evidence as the Architect or Owner may direct showing the Contractor's right to the payment claimed on the periodical estimate.

(c) *Materials stored.*-If periodic payments are made on account of materials delivered and suitably stored at the site but not incorporated in the work, they shall, if required by the Owner or the Architect, be conditional upon submission by the Contractor of bills of sale or such other procedure as will establish the Owner's title to such material or otherwise adequately protect the Owner's interest. [See also Articles E-28 and E-32] The Contractor is responsible for the existence, protection, and, if necessary, replacement of materials until execution of the final certificate of the Architect. [See also Articles E-12, E-25, and E-41] The owner shall not pay for any materials stored off site.

Article E-25. Certificate of Periodic Payments.-

(a) *Issuance.*-If the Contractor has made application for periodic payment as provided under Article E-24, the Architect shall not later than 7 days after receipt of progress payment issue to the Contractor a certificate for such amount as he decides to be properly due or state in writing his reasons for withholding a certificate.

(b) *Effect.*-No certificate issued nor payment made to the Contractor nor partial or entire use or occupancy of the work by the Owner shall be an acceptance of any work or materials not in accordance with the contract documents. [See also Article E-20]. The making of the final payment shall constitute a waiver of all claims by the Owner other than those arising from unsettled liens, from faulty work appearing after final payment, or from requirements of the specifications or drawings. Acceptance of the final payment shall operate as and shall be a release to the Owner from all claims of any kind or character under the contract except for such specific amount or amounts as may have been withheld to cover the fair value of any incomplete work which has been certified by the Architect under the provision of Paragraph (d) of Article 5 of the form of agreement as incomplete through no fault on the part of the Contractor.

(c) *Date and Rate of Payment.*-Progress payments will be made by the Owner to the Contractor in accordance with Article 4 of the form of agreement. Final payment will be made in accordance with Article 5 of the form of agreement. The date and rate of payment are subject to Article E-26. Sums retained pursuant to the present article are and remain the property of the Owner until such time as the Contractor shall have become entitled to receive payment of such retainage by (a) furnishing the remainder of the *quid pro quo* under the contract and (b) complying in full with the terms of the contract.

(d) *Interest.*-Should the Owner fail to pay the sum named in any certificate of the Architect upon demand when due, the Contractor shall receive, in addition to the sum named in the certificate, interest thereon at the legal rate in force at the place of building, PROVIDED: That the Contractor shall have given the Owner written notice of the date on which payment was properly due, and no interest shall be payable if the Owner makes payment within three days after receipt of the aforesaid notice from the Contractor. [See also Articles E-24, E-26, and E-46]

Article E-26. Payments Withheld.-The Architect may withhold or, on account of subsequently discovered evidence, nullify the whole or a part of any certificate to such extent as may be necessary to protect the Owner from loss on account of:

(a) Defective work not remedied [See also Article E-19]
(b) Claims filed or reasonable evidence indicating probable filing of claims.
(c) Failure of the Contractor to make payments properly to subcontractor or for materials or labor. [See also Articles E-9 and E-37]
(d) A reasonable doubt that the contract can be completed for the balance then unpaid.
(e) Damage to another contractor or to some third party. [See also Article E-12]
(f) Failure to maintain a rate of progress in accordance with the construction progress schedule. [See also Articles E-1(i), E-25(c), and E-46]
(g) Failure to supply enough skilled workmen or proper materials. [See also Articles E-1 and E-19]

When the above grounds are removed, payment shall be made for amounts withheld because of them. At the option of the Owner adherence to the construction progress schedule shall be a condition precedent to the right of the Contractor to demand payment of a periodical estimate. No omission on the part of the Owner to exercise the aforesaid option shall be construed to be a waiver of breach of the construction progress schedule or acquiescence therein, and the Owner may exercise its option from time to time and as often as may be expedient.

Article E-27. Indemnification, Insurance and Hazards.

(a) *Responsibility* - The Contractor shall be responsible to the Owner from the time of the signing the agreement or from the beginning of the first work, whichever shall be earlier, for all injury or damage of any kind resulting from any negligent act or omission or breach, failure or other default regarding the work by the Contractor, or any of its subcontractors, its agents, employees or others working at the direction of the Contractor or on its behalf, regardless of who may be the owner of the property. (See also Article E-12 and Exhibit F)

(b) *Indemnification Agreement* -Contractor hereby agrees to indemnify and hold harmless the Owner, the State of Georgia and its departments, agencies and instrumentalities and all of their respective officers, members, employees and directors (hereinafter collectively referred to as the "Indemnitees") from and against any and all claims, demands, liabilities, losses, costs or expenses, including attorneys' fees, due to liability to a third party or parties, for any loss *due*

to bodily injury (including death), personal injury, and property damage arising out of or resulting from the performance of this contract or any act or omission on the part of the Contractor, its agents, employees or others working at the direction of Contractor or on its behalf, or due to any breach of this contract by the Contractor, or due to the application or violation of any pertinent Federal, State or local law, rule or regulation. This indemnification extends to the successors and assigns of the Contractor. This indemnification obligation survives the termination of the contract and the dissolution or, to the extent allowed by law, the bankruptcy of the Contractor. If and to the extent such damage or loss (including costs and expenses) as covered by this indemnification is paid by the State Tort Claims Trust Fund, the State Authority Liability Trust Fund, the State Employee Broad Form Liability Fund, the State Insurance and Hazard Reserve Fund, and other self-insured funds (all such funds hereinafter collectively referred to as the "Funds") established and maintained by the State of Georgia Department of Administrative Services Risk Management Division (hereinafter "DOAS") the Contractor agrees to reimburse the Funds for such monies paid out by the Funds.

1.) - This indemnification applies where the Indemnitees are partially responsible for the situation giving rise to the claim, provided however, that this indemnification does not apply to the extent of the sole negligence of the Indemnitiees.

2.) - This indemnification does not extend beyond the scope of this contract and the work undertaken thereunder. Nor does this indemnification extend to claims for loses or injuries or damages incurred directly by the Indemnitees due to breach or default by the Indemnitees under the terms and conditions of this contract.

3.) - DOAS, Risk Management will endeavor to notify affected insurers of claims made against the State which fall within this indemnity. In the event of litigation, the Attorney General will endeavor to keep the Contractor and its general liability insurer as named on the insurance certificate informed regarding the claims and settlement. (See E-27.2.2(c) below.)

(c) *Insurance Requirements* -

1.) *Insurance Certificates* - The Contractor shall, prior to the commencement of work, procure the insurance coverages identified below at the Contractor's own expense and shall furnish the Owner an insurance certificate listing the Owner as the certificate holder. The insurance certificate must provide the following:

(a) Name and address of authorized agent
(b) Name and address of insured
(c) Name of insurance company(ies)
(d) Description of policies
(e) Policy Number(s)
(f) Policy Period(s)
(g) Limits of liability
(h) Name and address of Owner as certificate holder
(i) Project Name and Number
(j) Signature of authorized agent
(k) Telephone number of authorized agent
(l) Mandatory forty-five day notice of cancellation / non-renewal (See E-27 (c) 2.) (a) below).
(m) Evidence of Insurance Coverages shall be provided on the form shown in Exhibit F or on a form acceptable to the Owner.

2.) *Policy Provisions* - Each of the insurance coverages required below (i) shall be issued by a company licensed by the Insurance Commissioner to transact the business of insurance in the State of Georgia for the applicable line of insurance, and (ii) shall be an insurer (or, for qualified self insureds or group self insureds, a specific excess insurer providing statutory limits) with a Best Policyholders Rating of "A-" or better and with a financial size rating of Class V or larger. Each such policy shall contain the following provisions:

(a) The insurance company agrees that the policy shall not be canceled, changed, allowed to lapse or allowed to expire until forty-five (45) days after the Owner has received written notice thereof as evidenced by return receipt of registered letter or until such time as other insurance coverage providing protection equal to protection called for in this contract shall have been received, accepted and acknowledged by the Owner. Such notice shall be valid only as to the project as

shall have been designated by Project Number and Name in said notice.

(b) The policy shall not be subject to invalidation as to any insured by reason of any act or omission of another insured or any of its officers, employees, agents or other representatives ("Separation of Insureds").

(c) Each Insurer is hereby notified that the statutory requirement that the Attorney General of Georgia shall represent and defend the Indemnities remains in full force and effect and is not waived by issuance of any policy of insurance. In the event of litigation, any settlement on behalf of the indemnities must be expressly approved by the Attorney General. The contractor and its insurance carrier may retain, but are not obligated to retain, counsel to assist with the defense of the Indemnitees, in which case there will be mutual cooperation between the Attorney general and such counsel.

(d) Self-insured retention, except for qualified self-insurers or group self-insurers, in any policy shall not exceed $100,000.00.

3.) *Insurance Coverages* - The Contractor also agrees to purchase and have the authorized agent state on the insurance certificate that the following types of insurance coverages, not inconsistent with the policies and requirements of O.C.G.A. ′ 50-21-37, have been purchased by the Contractor. The minimum required coverages and liability limits are as follows:

(a) *Workers' Compensation Insurance* - The Contractor agrees to provide Workers′ Compensation coverage in accordance with the statutory limits as established by the General Assembly of the State of Georgia. A group insurer must submit a certificate of authority from the Insurance Commissioner approving the group insurance plan. A self-insurer must submit a certificate from the Georgia Board of Worker's Compensation stating the Contractor qualifies to pay its own worker's compensation claims. The Contractor shall require all subcontractors performing work under this contract to obtain an insurance certificate showing proof of Workers' Compensation Coverage and shall submit a certificate on the letterhead of the Contractor in the following language prior to the commencement of work:

This is to certify that all subcontractors performing work on this project are covered by their own workers' compensation insurance or are covered by the Contractor's worker's compensation insurance.

(b) *Employers′ Liability Insurance* - The Contractor shall also maintain Employer's Liability Insurance Coverage with limits of at least:

(i) Bodily Injury by Accident - $1,000,000 each accident; and
(ii) Bodily Injury by Disease - $1,000,000 each employee.

The Contractor shall require all subcontractors performing work under this contract to obtain an insurance certificate showing proof of Employers Liability Insurance Coverage and shall submit a certificate on the letterhead of the Contractor in the following language prior to the commencement of work:

This is to certify that all subcontractors performing work on this project are covered by their own Employers Liability Insurance Coverage or are covered by the Contractor's Employers Liability Insurance Coverage.

(c) Commercial General Liability Insurance - The Contractor shall provide Commercial General Liability Insurance (1993 ISO Occurrence Form or equivalent) which shall include, but need not be limited to, coverage for bodily injury and property damage arising from premises and operations liability, products and completed operations liability, blasting and explosion, collapse of structures, underground damage, personal injury liability and contractual liability. The Commercial General Liability Insurance shall provide at minimum the following limits:

Coverage	Limit
1. Premises and Operations	$ 1,000,000.00 per Occurrence
2. Products and Completed Operations	$ 1,000,000.00 per Occurrence
3. Personal Injury	$ 1,000,000.00 per Occurrence
4. Contractual	$ 1,000,000.00 per Occurrence
5. General Aggregate	$ 2,000,000.00 per Project

Additional Requirements for Commercial General Liability Insurance:

(1) The policy shall name as additional Insureds the officers, members, and employees of the Owner and the State of Georgia, but only with respect to claims that arise out of contractor's negligence in performing the work or the additional insured's general supervision of such operations, including completed operations under this contract, but only for such claims for which the Georgia Tort Claims Act, O.C.G.A. 50-21-20 *et seq.* is not the exclusive remedy.

(2) The coverage extended to the additional insureds for any claims not covered by the Georgia Tort Claims Act shall be no broader than the coverage extended to the Contractor and is not expanded to cover claims and losses that are not insurable under the contractor's policy.

(3) The policy or policies must be on an "occurrence" basis.

(4) The policy must include separate aggregate limits per project.

(d) *Commercial Business Automobile Liability Insurance* - The Contractor shall provide Commercial Business Automobile Liability Insurance which shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned or hired automobile. The Commercial Business Automobile Liability Insurance Policy shall provide not less than $1,000,000 Combined Single Limits for each occurrence.

Additional Requirements for Commercial Business Automobile Liability Insurance:

(1) The policy shall name as additional Insureds the officers, members, and employees of the Owner and the State of Georgia, but only with respect to claims that arise out of contractor's negligence in performing the work or the additional insured's general supervision of such operations under this contract, but only for such claims for which the Georgia Tort Claims Act, O.C.G.A. 50-21-20 *et seq.* is not the exclusive remedy.

(2) The coverage extended to the additional insureds for any claims not covered by the Georgia Tort Claims Act shall be no broader than the coverage extended to the Contractor and is not expanded to cover claims and losses that are not insurable under the contractor's policy.

(e) *Commercial Umbrella Liability Insurance* - The Contractor shall provide a Commercial Umbrella Liability Insurance to provide excess coverage above the Commercial General Liability, Commercial Business Automobile Liability and the Workers' Compensation and Employers' Liability to satisfy the minimum limits set forth herein. The minimum amount of Umbrella limits required above the coverages and minimum limits state in E-27.2.3(a), (b), (c) and (d) shall be:

Minimum Combined Primary Liability and Excess Umbrella Limits of:
$ 2,000,000 per Occurrence
$ 2,000,000 Aggregate

Additional Requirements for Commercial Umbrella Liability Insurance:

(1) The policy shall name as additional Insureds the officers, members, and employees of the Owner and the State of Georgia, but only with respect to claims that arise out of contractor's negligence in performing the work or the additional insured's general supervision of such operations under this contract, but only for such claims for which the Georgia Tort Claims Act, O.C.G.A. 50-21-20 et. seq. is not the exclusive remedy.

(2) The coverage extended to the additional insureds for any claims not covered by the Georgia Tort Claims Act shall be no broader than the coverage extended to the Contractor and is not expanded to cover claims and losses that are not insurable under the contractor's policy.

(3) The policy must be on an "occurrence" basis.

(f) *Builders Risk Insurance* - Contractor shall provide a Builder's Risk Policy to be made payable to the Owner and Contractor , as their interests may appear. The policy amount should be equal to 100% of the contract sum, written on a 1991 Causes of Loss - Special Form, or it's equivalent. All deductibles shall be the sole responsibility of the Contractor, and in no event shall the amount of any deductible exceed $10,000.00. The policy shall be indorsed as follows:

"The following may occur without diminishing, changing, altering or otherwise affecting the coverage and protection afforded the insured under this policy:

(i) Furniture and equipment may be delivered to the insured premises and installed in place ready for use; and

(ii) Partial or complete occupancy by Owner; and

(iii) Performance of work in connection with construction operations insured by the Owner, by agents or lessees or other contractors of the Owner, or by contractors of the lessee of the Owner."

In the event that the contract is for renovation, addition or modification of an existing structure and Builders Risk Insurance is not available, the Owner will accept an Installation Floater Insurance Policy with the above endorsements (E-27.2.3(f)) in lieu of the Builders' Risk Insurance Policy. Such floater must insure loss to materials and equipment prior to acceptance by Owner and must be on an ALL RISK BASIS with the policy written on a specific job site.

(g) *Disposition of Insurance Documents* - Prior to commencing work, one certificate of insurance with all endorsements attached must be deposited with Owner for each insurance policy required.

4.) *Termination of Obligation to Insure* - Unless otherwise expressly provided to the contrary, the obligation to insure as provided herein shall not terminate until the Architect shall have executed the final certificate. (See Articles E-20, E-24, E-29, and E-71, Article 5, Form of Contract.).

5.) *Failure of Insurers* - The Contractor is responsible for any delay resulting from the failure of his insurance carriers to furnish proof of proper coverage in the prescribed form.

Article E-28. Affidavits.-Before receiving any portion of the retainage [See also Articles E-24 and E-32] the Contractor will be required to furnish a non-influence affidavit as shown in Exhibit A and a statutory affidavit in the exact form as shown in Exhibit B.

Article E-29. Bonds on Roofs and Walls. *Five-Year Bond.*--Prior to demand for payment of retainage, the Contractor shall furnish to the Owner a five-year bond written by a surety authorized to do business in the State of Georgia in accordance with Form No. 229 set forth in Exhibit G and in the penal sum of not less than the amount shown as the cost of the roof and roof deck in the approved initial breakdown.

Article E-30. Performance Bond and Payment Bond.-The Contractor shall furnish both a performance bond and a payment bond (Form No. 160) as set forth in Exhibit C and Exhibit D. The surety must be one which is licensed to do business in the State of Georgia, and the surety must in addition be acceptable to the Owner. To be acceptable the surety must be listed in the Department of Treasury's Listing of Approved Sureties (Department Circular 570).]

Article E-31. OMITTED

Article E-32. Liens. -

(1) Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the Owner a complete release of all liens or claims arising out of this contract, or receipts in full in place thereof and, if required in either case, an affidavit that so far as he has knowledge or information the releases and receipts include all labor and materials for which a lien or claim could be filed; but the Contractor may, if any subcontractor or claimant refuses to furnish a release or receipt in full, furnish a bond satisfactory to the Owner to indemnify the Owner against any lien or claim. If any lien or claim remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such lien or claim, including all costs and a reasonable attorney's fee [See also Articles E-24, E-25, and E-28]

(2) Not later than 15 days after the contractor commences work on the property, a Notice of Commencement shall be filed by the contractor with the clerk of the superior court in the county in which the project is located in accordance with Georgia Code Section 44-14-361.5.

Article E-33. Assignment. - Neither party to the contract shall assign the contract or sublet it as a whole nor shall the Contractor assign any moneys due or to become due to him hereunder.

Article E-34. Mutual Responsibility of Contractors. - Should the Contractor cause damage to any separate Contractor on the work the Contractor agrees, upon due notice, to settle with such Contractor by agreement if he will so settle. If such separate Contractor sues the Owner on account of any damage alleged to have been so sustained, the Owner shall notify the Contractor who shall defend such proceedings at his own expense, and if any judgment against the Owner shall arise therefrom, the Contractor shall pay or satisfy it and pay all costs incurred by the Owner.

Article E-35. Separate Contracts. -

(a) *Duty of Contractor to Cooperate with Other Contractors*.-The Owner reserves the right to let other contracts in connection with this work. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly regulate, schedule, connect, and coordinate his work with theirs.

(b) *Duty of Contractor to Report Defects*.-If any part of the Contractor's work depends for proper execution or results upon the work of any other Contractor, the Contractor shall inspect and promptly report to the Architect any defects in such work that render it unsuitable for such proper execution and results. The Contractor's failure to inspect and report shall constitute an acceptance of the other Contractor's work as fit and proper for the reception of the Contractor's work, except as to defects which may develop in the other Contractor's work after the execution of the Contractor's work.

(c) *Duty of Contractor to Report Conflicts*.-To ensure the proper execution of his subsequent work the Contractor shall measure work already in place and shall at once report to the Architect any discrepancy between the executed work and the drawings or specifications. [See also Article E-40]

(d) *Equipment.*-Article E-35 also applies to installation of loose equipment and fixtures by the Owner or a lessee of the Owner, PROVIDED: That the Architect shall have rendered a decision in writing that no inconvenience to the Contractor will result. [See also Article E-34]

Article E-36. Subcontractors, Materialmen, Suppliers, and Employees.-

(a) *Submission of list*.-As soon as possible after notice of award of the contract and in any event not later than three days prior to the time fixed in the contract for delivery of the executed form of agreement to the Owner, the Contractor shall submit in writing to the Architect a list of the names of subcontractors the Contractor will employ on the work. The list of subcontractors is not submitted for approval but is for the purpose of establishing ...

(1) What trades and portions of the work are to be performed under subcontract, and
(2) The names of the parties selected by the Contractor to perform work by subcontract, the aforesaid selection being a matter lying solely within the discretion of the Contractor.
(3) The contractor shall identify each minority owned and each female owned subcontractor performing work on the project.
(4) By not later than the 10th day of the month following the end of each quarter the general contractor shall submit to the owner a list of all minority and female owned subcontractors performing work on the project and the amount paid to each for that quarter.

(b) *No approval of subcontractors*.-Neither the Owner nor the Architect undertakes to pass upon or approve any subcontractor; however, if a fire protection sprinkler system is required, the general contractor shall submit to the Architect the certificate of competency of the fire protection sprinkler system subcontractor as required by State of Georgia Fire Protection and Safety code Section 25-11-4. The certificate of competency shall be provided to the Architect prior to any work being performed on the fire protection sprinkler system.

(c) *Warranty of Contractor*.-The Contractor warrants that the subcontractors selected by him are reputable, skilled, reliable, competent, qualified in the trade or field in which they are to perform on the project, and thoroughly familiar with applicable codes.

(d) *Certification on account of.* -The Architect shall, on request furnish to any subcontractor, wherever practicable, evidence of the amounts certified on his account.

(e) *Contractor responsible for acts and omissions of subcontractors, materialmen, suppliers, and employees.*- The Contractor agrees that he is as fully responsible for the acts and omissions of his subcontractors, materialmen, suppliers, and employees and of persons either directly or indirectly employed by them as he is for the acts and omissions of persons directly employed by him. The failure of a subcontractor, materialman, supplier, or employee to perform shall not be asserted by the Contractor as an excuse for any omission from or noncompliance with requirements of the contract; nor shall the Contractor be entitled to an extension of time because of failure of a subcontractor, materialman, supplier, or employee to perform unless said failure was a direct result of some delay to the subcontractor, materialman, supplier, or employee of the kind and character described under Article E-18 for which the Contractor shall have requested and received an extension of time under the terms of Article E-18 of the general conditions. [See Also Article E-37(a)(3)] The subcontracting of work does not relieve the Contractor of the full responsibility for the execution of the work and for compliance with all requirements of the contract documents. The Contractor shall not assert negligence, inefficiency, insolvency, bankruptcy, or incompetence of any subcontractor, materialman, supplier, or employee as excuse for the existence of any noncompliance with or omission to fulfill any obligation under the contract either as to timely performance or as to compliance with methods and materials designated in the contract documents; nor shall the Contractor assert nonperformance (unless an extension of time shall have been granted pursuant to Article E-18 as referred to hereinabove) of a subcontractor, materialman, supplier, or employee as excuse for the existence of any noncompliance with or omission to fulfill any obligation under the contract either as to timely performance or as to compliance with methods and materials designated in the contract documents. As to subcontractors, materialmen, suppliers, and employees of the Contractor, the doctrine that a principal is liable for the acts and omissions of his agent shall be binding on the Contractor in his relationship to the Owner, and the Contractor may not reverse the aforesaid doctrine by serving as a conduit or agent for his own agent. [See also Article E-16 and condition of payment bond, Article E-30] Any provision in any contract between the Contractor and any subcontractor pursuant to which the Contractor is obliged to present to the Owner any claim of any subcontractor shall be invalid. [See also Article E-37(1)]

(f) *No contract between Owner and any subcontractor, materialman, supplier, or employee*.- Nothing contained in

the contract documents shall create any contractual relation between the Owner and any subcontractor or between the Owner and any materialman, supplier, or employee of the Contractor or his subcontractors. [See also Article E-2, E-37, E-45, and E-60]

Article E-37. Relationship of Contractor and Subcontractors.-

(a) *Obligations of Each*.-The Contractor agrees to bind every subcontractor and every subcontractor agrees to be bound by the terms of the contract documents insofar as they are applicable to his work, including the following provisions of this article:

THE SUBCONTRACTOR AGREES:

(1) To be bound to the Contractor by the terms of the contract documents and to assume toward the Contractor all the obligations and responsibilities that the Contractor by the aforesaid documents assumes toward the Owner.

(2) To submit to the Contractor applications for payment in such reasonable time as to enable the Contractor to apply for payment under Article E-24 of the general conditions.

(3) To make all claims for extras, for extensions of time [See Articles E-16, E-18 and E-36] or for damages to the Contractor in the manner provided in the general conditions for like claims by the Contractor upon the Owner, except that the time for making such claims to the Contractor is 5 days.

THE CONTRACTOR AGREES:

(1) To be bound to the subcontractor by all the obligations that the Owner assumes to the Contractor under the contract documents.

(2) To pay the subcontractor upon the payment of certificates issued under the schedule of values described in Article E-24 of the general conditions the amount allowed to the Contractor on account of the subcontractor's work to the extent of the subcontractor's interest therein; provided, however, that retainage shall be paid to the subcontractor as provided in the statutory affidavit specified under Article E-28.

(3) To pay the subcontractor upon the payment of certificates issued otherwise than as in Subparagraph E-37(a)(5) above in such manner that at all times the subcontractor's total payments shall be as large in proportion to the value of the work done by the subcontractor as the total amount certified to the Contractor is to the value of the work done by the subcontractor.

(4) To pay the subcontractor to such extent as may be provided by the contract documents or the subcontract, if either of these provides for earlier or larger payments than the above.

(5) To pay the subcontractor on demand for his work or materials as far as executed and fixed in place, less the retained percentage, at the time the certificate should issue, even though the Architect fails to issue it for any cause not the fault of the subcontractor.

(6) To pay the subcontractor a just share of any fire insurance money received by the Contractor.

(7) To make no demand for liquidated damages or penalty for delay in any sum in excess of such amount as may be specifically named in the subcontract.

(8) That no claim for services rendered or materials furnished by the Contractor to the subcontractor shall be valid unless written notice thereof is given by the Contractor to the subcontractor during the first ten days of the calendar month following that in which the claim originated.

(9) To give the subcontractor an opportunity to be present and to submit evidence in any dispute involving rights of the subcontractor. [See also Article E-36(e)]

(b) Owner Not Obligated to any Subcontractor.-There is no obligation on the part of the Owner to pay to or to see to the payment of any sums to any (1) subcontractor, (2) materialman, (3) supplier, (4) laborer, (5) employee, or (6) claimant as defined in the payment bond.[See also Article E-36(d)

(c) *Incorporation of Terms in Subcontracts*.-The Contractor agrees that failure on his part to incorporate in all subcontracts an express provision in accordance with Article E-37(a), above, shall be deemed to be and is a breach of an essential covenant and that in the event of such breach the Contractor shall, within five days after demand of the Owner, furnish proof in writing that the deficiency has been remedied to the end that (1) the Contractor may not maintain that it is beyond his competence to require performance of terms of the contract by a subcontractor and (2) no subcontractor may maintain that he has not assumed toward the Contractor all the obligations and responsibilities that the Contractor has assumed toward the Owner. Failure on the part of a Contractor to effect remedy as above within five (5) days after receipt of written demand of the Owner shall be ipso facto ground for issuance of a declaration of default by the Owner. [See also Articles E-15, E-34, and E-36]

Article E-38. Architect.-

(a) *Supervision*.-The Architect shall have general supervision and direction of the work except in respect to safety as stated under Article E-12 and except as qualified by Articles E-13 and E-60 of the general conditions. He is the agent of the Owner only when in special instances he is authorized in writing by the Owner so to act, and in such instances he shall, upon request, show the Contractor written authority. He has authority to stop the work whenever such stoppage may be necessary to ensure the proper execution of the contract.

(b) *Interpreter and Impartial Judge*.-As the Architect is, in the first instance, the interpreter of the conditions of the contract and the judge of its performance, he shall side neither with the Owner nor with the Contractor but shall use his powers under the contract to enforce its faithful performance by both.

(c) *Succession.*-In case of the termination of the employment of the Architect, the Owner shall appoint a capable and reputable Architect against whom the Contractor makes no reasonable objection and whose status under the contract shall be that of the former Architect.

Article E-39. Architect's Decisions.-

(a) *Promptness.*-The Architect shall make decisions with reasonable promptness after presentation of evidence on (l) any claim of the Owner or Contractor, (2) a demand of the Owner or Contractor for a decision on any matter relating to the execution or progress of the work, or (3) a demand of the Contractor or Owner for interpretation of or additional instructions with respect to the contract documents. [See also Articles E-3 and E-16]

(b) *On artistic effect*.-The Architect's decisions in matters relating to artistic effect shall be final if within the terms of the contract documents.

(c) *Claims for alleged procrastination*.-No claim for delay to the Contractor or for additional expense to the Contractor shall be allowed on account of failure of the Architect to render decisions, make interpretations, or furnish additional instructions unless a written claim for additional compensation, damages, or extension of time served upon the Architect and the Owner and not then unless such claim be reasonable, and in accordance with Articles E-3, E-15, or E-16.

Article E-40. Measurements and Dimensions.-Before ordering material or doing work which is dependent upon coordination with building conditions, the Contractor shall verify all dimensions, elevations, grades, and pitch by taking measurements at the building and shall be responsible for the correctness of same. No consideration will be given to any claim based on differences between the actual dimensions and those indicated on the drawings. Any discrepancies between the drawings and/or specifications and the existing conditions shall be referred to the Architect for additional instructions before any work affected thereby is begun. [See also Articles E-14, E-35(c), and E-40]

Article E-41. Notice of Readiness for Final Inspection.-When the Contractor is ready for a final inspection, he shall give notice to the Architect in accordance with Article 5 of the form of agreement with a copy to the Owner in the following words:

> The work on the contract is for VAV Boxes and Controls Replacement in Academic Building, Gordon College, Barnesville, Georgia project having been

fully completed except as stipulated herein below, it is requested that a final inspection be made promptly by the Architect in accordance with Article 5 of the form of agreement. The following work is incomplete through no fault of the Contractor [list any work which the Contractor regards as a proper exception under Subparagraph (d) of Article 5 of the form of agreement] [See Article E-71 for specimen of form of agreement].

No final inspection shall be made until such time as the Architect has received a letter in the exact form indicated above and a copy thereof has been received by the Owner. In the event the Contractor shall have issued the "Notice of Readiness for Final Inspection" prematurely [hereinafter referred to as "false start"] he shall be liable for the damage resulting from the aforesaid false start including but not limited to the salaries, professional fees, and travel and living expenses of the persons or parties inconvenienced by the aforesaid false start. [See also Article E-16] The Contractor acknowledges and agrees that he has an indivisible, indelegable, and intransferable contractual obligation to the Owner to make his own inspections of his own work at all stages of construction; and he shall supervise and superintend performance of the contract in such manner as to enable him to confirm and corroborate at all times that all work has been executed strictly, literally, rigidly, and inflexibly in accordance with the methods and materials designated in the contract documents so that (a) his certifications on periodical estimates shall be true and correct and (b) his notice of readiness for final inspection shall be true and correct. [See also Articles E-13, E-14, E-24, E-26, and E-46] Accordingly, the Contractor agrees that he may not defend or excuse any deviation from the contract documents on the ground (a) that the deviation was not brought to his attention by another person or party or other persons or parties or (b) that a subcontractor is or subcontractors are at fault.

No final inspection shall be requested by the Contractor until such time as the Contractor has provided to the Architect a copy of the initial test and balance report on the heating, ventilating and air conditioning system.

No final inspection shall be requested by the contractor until such time as the contractor has provided operation and maintenance instructions [See Article E-55].

No final inspection shall be requested by the contractor until such time as all systems are operational.

All references in the trade sections to substantial completion are hereby deleted.

Article E-42. Use of Premises.-The Contractor shall confine his plant, his apparatus, the staging and storage of materials, the operations of his forces, and the work to limits indicated by law, ordinances, permits, or the contract documents and shall not unreasonably encumber the premises with his materials. The Contractor shall not load or permit any part of the work to be loaded with weight that will endanger its safety. The Contractor shall enforce the Architect's instructions regarding signs, advertisements, fires and smoking. [See also Article E-11]

Article E-43. Cutting, Patching, and Fitting.-The Contractor shall do all cutting, fitting, or patching of his work that may be required to make its several parts come together properly and fit. [See also Articles E-03, E-40, and E-53]

Article E-44. Cleaning Up.-The Contractor shall at all times keep the premises free from accumulations of waste material or rubbish caused by his employees or work. At the completion of the work he shall remove all his rubbish from and about the building and all his tools, scaffolding, and surplus materials and shall leave his work "broom-clean" or its equivalent, unless more exactly specified. In case of dispute the Owner may remove the rubbish and charge the cost to the Contractor as the Architect shall determine to be just. [See also Articles E-12 and E-27]

Article E-45. Specification Arrangement.-The specifications are separated into numbered and titled divisions for convenience of reference. Neither the Owner nor the Architect assumes any responsibility for defining the limits of any subcontracts on account of the arrangement of the specifications. Notwithstanding the appearance of such language in the various divisions of the specifications as, "The Plumbing Contractor", "The Electrical Contractor", "The Roofing Contractor", etc., the general contractor is responsible to the Owner for the entire contract and the execution of all of the work referred to in the contract documents. No partial sets of bidding documents shall be issued by the Architect. [See also Article C-03, E-2, E-36, and E-37]

Article E-46. Commencement, Prosecution and Completion.-The Contractor will be required (a) to commence work under this contract within ten days after date of written notice from the Owner to proceed [See Article E-1(j)], (b) to prosecute the work with faithfulness and energy (c) to install the various parts of the work with equal steps shown on

the construction progress schedule and at the same rate shown on the construction progress schedule to be furnished pursuant to Article E-50 and (d) to complete the work within the time stipulated in the bid form as adjusted by any extensions of time provided for under Articles E-15 and E-18. Commencement of work shall mean actual physical work on the site. [See Also Articles E-1(f) and E-1(i)] In the event the Contractor shall be delinquent in respect to compliance with the time limits established in the construction progress schedule, he shall, within seven days after receipt of written demand of the Owner, commence working not less than a twelve hour day and no less than six days a week until such time as he shall have brought the amount of work in place into compliance with the construction progress schedule. Fulfillment of this requirement as to overtime work (hereinafter referred to as "recovery of lost time required of the Contractor for his breach of covenant as to time") shall not relieve the Contractor from liability for breach of the covenant as to time [Article E-1(f) of general conditions]. For account of recovery of lost time required of the Contractor for his breach of covenant as to time the Contractor shall be entitled to no claim against the Owner for any payment, repayment, reimbursement, remittance, remuneration, compensation, profit, cost, overhead, expense, loss expenditure, allowance, charge, demand, hire, wages, salary, tax, cash, assessment, price, money, bill, statement, dues, recovery, restitution, benefit, recoupment, exaction, injury or damages. [See also Articles E-25 and E-26]

Article E-47. Alternates.-Unless otherwise stipulated all alternate bids are additive. No alternate bids will be taken unless the base bid is below the amount of money budgeted for the project. [See also Article C-04(d)]

Article E-48. Drug-Free Work Place Act.- The Contractor acknowledges that he is fully aware of the contents and requirements of O.C.G.A. 50-24-1 *et. seq*. The Contractor, upon submission of a bid in connection with this contract, does thereby certify that he and his subcontractors are and will remain in compliance with the aforesaid act.

Article E-49. Conflicts.-The following principles shall govern the settlement of disputes which may arise over conflicts in the contract documents: (a) as between figures given on drawings and the scaled measurements, the figures shall govern; (b) as between large-scale drawings and small-scale drawings, the larger scale shall govern; (c) as between drawings and specifications, the requirements of the specifications shall govern; and (d) as between the contract and the specifications, the requirements of the contract, as executed, shall govern. Conflicts noted shall be reported to the Architect. The principles set forth herein shall not alter provisions of Article E-2 of the general conditions. Schedules, lists, indexes, tables, inventories, written instructions, written descriptions, summaries, statements, classifications, specifications, written selections, or written designations although appearing on the drawings are deemed to be and are "specifications" within the meaning of Article E-49.

Article E-50. Progress Reports.-Within such reasonable space of time as the Owner shall designate in writing, the Contractor shall submit to the Owner such schedule of quantities and costs, construction progress schedules, payrolls, bills, vouchers, correct copies of all subcontracts, statements, reports, correct copies of all agreements, correspondence, and written transactions with the surety on the performance bond which have any relevance to the work, estimates, records, and other data as the Owner may request concerning work performed or to be performed under this contract. When requested by the Owner, the Contractor shall give the Owner access to accounts relating to the foregoing. The above reports shall include but are not limited to (a) written notice of dates by which specified work will have been completed, (b) written notice of dates by which condemned work shall have been made good, (c) written notice that condemned work has been made good, (d) written notice as to the date or dates by which work which has not been performed with equal steps and at the same rate required by the construction progress schedule shall have been brought into conformity with the construction progress schedule, (e) date by which any undisputed claim of a subcontractor, materialman, or laborer shall have been paid, (f) written advice regarding the nature and amount of any disputed claim of a subcontractor, materialman, or laborer, and (g) information regarding work performed under Case (b) or Case (c) of Article E-15 upon demand of the Owner pursuant to Article E-15(k). Prior to submitting the first periodical estimate [See Article E-24], the Contractor shall have furnished to the Owner and the Architect a construction progress schedule (based on work in place only) in accordance with the style and format of a specimen to be furnished by the Owner [copies of which specimen will be furnished to any bidder on request].[See also Articles E-1(i), E-19, E-20, E-26, and E-46]

Article E-51. Omitted

Article E-52. Trading with the State Statute.-In 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 prohibiting officials and employees of the state from engaging in certain transactions with the state and state agencies, have not and will not be violated in any respect in regard to this contract.

Article E-53. Manufacturer's Recommendations.-In the event the contract shall require that given work or materials shall be installed in accordance with the manufacturer's recommendations or requirements, the Contractor shall obtain for his use at the site in executing the work copies of the bulletin, circular, catalogue, or other publication of the manufacturer bearing the title, number, edition, date, etc., [hereinafter referred to as the "doctrine"] designated in the contract. In the event no such designation appears in the contract documents, the Contractor shall not proceed with the installation of the work or materials until (1) he shall have requested from the Architect in writing (with copy of the request to the Owner) additional instructions pursuant to Article E-3 of the general conditions as to title, number, edition, date, etc., of the bulletin, circular, catalogue or other publication of the manufacturer which contains the manufacturer's published recommendations or requirements for installation and use of the product and (2) until he shall have received the aforesaid additional instructions. Prior to proceeding with the installation of the said work or materials, the Contractor shall obtain for his use at the site in executing the work the "doctrine" designated in the said additional instructions of the Architect. The plans and specifications shall be adhered to in all cases where they call for quality of materials, quality of workmanship, or quality of construction which is equal to or in excess of the quality called for in the manufacturer's recommendations or requirements. There may be no deviations from the plans and specifications except to the extent that the said deviations shall be necessary in order to comply with the manufacturer's express recommendations or express requirements. Any changes necessary to comply with the manufacturer's express recommendations or express requirements shall be made at no additional expense to the Owner.[See also Articles E-5, E-43, E-55, and E-67]

Article E-54. Omitted

Article E-55. Operation and Maintenance Data and Instructions.- Prior to furnishing instructions to the lessee of the owner concerning operation and maintenance of all mechanical and electrical equipment and prior to making request for final inspection, the Contractor shall put all mechanical systems and equipment into operation and shall make all tests and adjustments. The Contractor shall furnish proper instructions to the lessee of the Owner in the presence of the Architect concerning operation and maintenance of all mechanical and electrical equipment. The Contractor shall give notice in writing to the Architect with copy to the Owner at least fifteen days prior to the date on which it is proposed to give instructions to the lessee. The aforesaid notice shall state the date and hour the giving of instructions will commence. The aforesaid notice shall not (repeat NOT) be given to the using agency. For all items of mechanical or electrical equipment or apparatus installed which require operation or maintenance after occupancy, the Contractor shall furnish and deliver to the Owner [not (repeat NOT) to the lessee] complete brochures and data as prepared and published by the manufacturers covering details of operation and maintenance. [See also Articles E-53, E-62, and E-67]

Article E-56. Space Conditions.-All pipes passing through floors, walls, and ceilings shall be installed with sufficient space between them to permit installation of pipe insulation and floor, wall, and ceiling plates without cutting of insulation or plates. Roughing dimensions shall be prepared by the Contractor to accomplish this requirement. The Contractor shall locate all equipment which must be serviced, operated, or maintained in fully accessible positions. This provision includes but is not limited to valves, traps, cleanouts, motors, controllers, switchgear, drain points, and fire dampers. If spaces, dimensions, or other design conditions do not permit compliance with the present article, the Contractor shall file a demand in writing with the Architect for additional instructions pursuant to Article E-3, furnishing a copy of the aforesaid demand to the Owner. [See also Articles E-3 and E-40]

Article E-57. Cash Allowances.-The Contractor shall include in the contract sum all allowances named in the contract documents and shall cause the work thus covered to be done by such contractors and for such sums as the Architect may direct, the contract sum being adjusted in conformity therewith. The Contractor declares that the contract sum includes such sums for overhead and profit on account of cash allowances as he deems proper. No demand for overhead and profit other than those included in the contract sum shall be allowed. The Contractor shall not be required to employ for any such work persons against whom he has a reasonable objection.

Article E-58. Testing Services.-Laboratories for testing services shall be selected by, engaged by, and responsible to the Architect, Provided: That, in the case of tests (a) prescribed in the contract documents or any part thereof, including Article E-13 of the general conditions or (b) requested by the Architect , the Contractor shall give notice to the Architect in writing stating the date and the hour when he will be ready for the test to be made and in the event the test fails or the Contractor is not ready for the test, the expense of the services of the testing laboratory shall be applied against the contract fees by a credit adjustment to the Owner effected by the furnishing of notice to the Contractor by the Owner accompanied by a copy of the statement for the testing services on the test which failed or for which the Contractor was not ready. This article does not apply to verification of design mix on concrete. [See also Articles E-13 and E-65]

Article E-59. Omitted

Article E-60. Contractor's Warranty as to Performance.-The Contractor warrants that he is familiar with the codes applicable to the work and that he has the skill, knowledge, competence, organization, and plant to execute the work promptly and efficiently in compliance with the requirements of the contract documents. The Contractor having the obligation to keep a competent superintendent on the work during its progress, to employ only skilled mechanics, and to enforce strict discipline and good order among his employees, the Contractor, himself, is responsible for seeing that the work is installed in accordance with the contract documents. Failure or omission on the part of the Owner, representatives of the Owner, agents of the Owner, resident engineer inspector, clerk-of-the-works, engineers employed by the Architect, representatives of the Architect, or the Architect either to discover or to bring to the attention of the Contractor any deviation from, omission from, or noncompliance with the contract documents shall not be set up by the Contractor as a defense for failure on his part to install the work in accordance with the contract documents or for any other neglect to fulfill requirements of the contract; nor shall the presence of any one, or all, or any of the foregoing at the site or the fact that any one, or all, or any of the foregoing may have examined the work or any part of it be set up as a defense by the Contractor against a claim for failure on his part to install the work in accordance with the contact documents or for any neglect to fulfill requirements of the contract; nor shall the presence of any one, or all, or any of the foregoing at the site or the fact that any one, or all, or any of the foregoing may have examined the work or any part of it be set up as a defense by the Contractor against a claim for failure on his part to install the work in accordance with the contract documents or for any neglect to fulfill requirements of the contract. No requirement of this contract may be altered or waived except in pursuance of a written order of the Owner and in strict accordance with the provisions in the contract for changes in the work. [See also Articles E-9, E-13, E-14, E-15, E-20, E-36, E-38, and E-39]

Article E-61. Employment of Georgia Citizens and Use of Georgia Products and Georgia Forest Products. - Since the work provided for in this contract is to be performed in Georgia, it is the wish 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 nor 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. O.C.G.A. 50-5-60 to 63 are hereby incorporated into the general conditions of the contract as follows:

(a) No contract for the construction of, addition to, or repair of any facility, the cost of which is borne by the State, or any department, agency, commission, authority, or political subdivision thereof shall be let, unless said contract contains a stipulation therein providing that the Construction Manager or Trade Contractor shall use exclusively Georgia forest products in construction thereof, when forest products are to be used in such construction, addition or repair, and if Georgia forest products are available.

(b) The provisions of the Act Shall not apply when in conflict with Federal rules and regulations concerning construction.

Article E-62. Omitted

Article E-63. Omitted

Article E-64. Effect of Addenda, Amendments, Bulletins, Deletions, Omissions, and Change Orders.-No special implication, interpretation, construction, connotation, denotation, import, or meaning shall be assigned to any provision of the contract documents because of changes created by the issuance of any (1) addendum, (2) amendment, (3) bulletin, (4) notice of deletion, (5) notice of omission, or (6) change order other than the precise meaning that the contact documents would have had if the provision thus created had read originally as it reads subsequently to the (1) addendum, (2) amendment, (3) bulletin, (4) notice of deletion, (5) notice of omission, or (6) change order by which it was created.

Article E-65. Concrete Specifications.-"Standard Minimum Concrete Specifications", October 1963, revised May 1976, revisions approved jointly by the Georgia Branch, The Associated General Contractors of America, and Georgia

Concrete and Products Association, Inc., successors to Georgia Ready-Mix Concrete Association are adopted as a minimum requirement, but in the event any other provision of the contract documents provides for materials, conditions, or services which exceed in quality the materials, conditions, or services required under the aforesaid "Standard Minimum Concrete Specifications", October 1963, revised May 1976, the higher quality of materials, conditions, or services shall govern. Copies of the above-mentioned "Standard Minimum Concrete Specifications" may be obtained from Georgia Branch, Associated General Contractors of America, 163 Harris Street, N. W., Atlanta, Georgia, without cost. Paragraph 3.3(d) of the aforesaid revised "Standard Minimum Concrete Specifications" is amended by deleting the eighth line in its entirety and substituting in place thereof the following:

"... with Article E-17 of the general conditions. Load tests shall be made and . . ."

Paragraph 4.1(b) of the aforesaid revised "Standard Minimum Concrete Specifications" is deleted in its entirety and the following is inserted therefor:

(b) Prior to commencement of concrete work, the laboratory shall provide physical and written instructions in the performance of these sampling and testing duties for one or more employees designated by the Contractor.

The last paragraph in Article 4.2 of the above-mentioned revised concrete specifications is corrected to read "(c)" instead of "(b)" in order to maintain sequence. In regard to the first and second sentences of Article 4.2(b) of the above-mentioned revised concrete specifications, it is hereby expressly agreed by the Owner and the Contractor that as a requirement of the project specifications the Contractor shall sample, mold, initially cure and transport to the laboratory the acceptance test specimens required by Section 3.3 of the aforesaid revised concrete specifications.

Article E-66. Fire Marshal Inspections.

(a) *General*. The State Fire Marshal may make inspections at any time. It shall be the responsibility of the Contractor to request an inspection at 80% completion and at 100% inspection and to give notice when all items on the 100% inspection report have been completed. Requests shall be in writing with a copy to the Owner and Architect. The basic definitions for 80% and 100% inspections are as follows:

80% Inspection: The structural components are in place and open for review of the fire safety components. NOTE: Structural components include the following: fire walls, vertical shafts, stairways, smoke stops, hazardous area separation, roof and ceiling assemblies, corridor and door width, and HVAC system.

100% Inspection: The contractor has completed all of the items on the 80% inspection report.

(b) *Certificate of Occupancy*: The contractor's obligation under the contract is to install the work in accordance with the plans and specifications. The architect's obligation is to design the work to comply with the applicable codes and to qualify for a Certificate of Occupancy. It is not the responsibility of the contractor to obtain the Certificate of Occupancy.

Article E-67. Certificates of Manufacturers for Major Components.-

(1) For major components of air conditioning systems [i.e., chiller units, base mounted pumps, and temperature controls]; start-up, testing, and placing into operation shall be performed by the field representative(s) of the manufacturer(s), and certificate(s) of the manufacturer(s) shall be filed with the Owner on the letterhead(s) of the manufacturer(s) in which the manufacturer(s) certifies or certify that "the equipment has been installed in strict compliance with the recommendations of the manufacturer(s) and is operating properly". [See specimen of certificate, Form No 290, Exhibit H] The manufacturer(s) shall list in the certificate the item or items furnished to the job. The date, name, or other positive means of identifying the exact document or documents containing the recommendations of the manufacturer(s) shall be set forth in the certificate. A copy of each of the aforesaid documents shall be attached to the certificate. A specimen of the certificate will be furnished by the Owner and shall be adhered to by the manufacturer(s) in preparing the certificate. The Contractor expressly agrees that the aforesaid manufacturer(s) is (are) solely the agent(s) of the Contractor. The Contractor shall coordinate the performance of the aforesaid services and shall, in all cases where the equipment of two or more manufacturers ties in and functions together, require the field representatives to perform simultaneously the initial start-up, the testing, and the placing of their equipment into operation. "Start-up" is defined as putting the equipment into action. "Testing" is defined as performing such testing as is stipulated in the contract documents to be performed. "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. [See also Articles E-53 and E-55]

(2) For each certificate required for major components a sum of $500.00 shall be withheld until such certificate as described in Article E-67 shall have been filed with the Owner.

Article E-68. Forms and Specimens. - The forms and specimens attached as exhibits are incorporated by reference herein and shall be executed in substantial conformance as required or convenient in describing obligations under the contract documents.

Article E-69. Copies of Notices to Owner. Wherever the general conditions provide that a copy of any notice, request, or demand filed with the Architect by the Contractor shall be furnished to the Owner, such notice, request or demand shall not become effective until the Owner's copy shall have been received by the Owner. No notice in writing or orally to the Architect or to the resident engineer inspector is notice to the Owner unless copy of the aforesaid notice in writing shall have been properly served upon the Owner at the address shown in Article D-01 of the Supplementary General Conditions. [See also Articles E-1(d), E-3, E-15, E-16, E-18, and E-39]

Article E-70. Omitted

Article E-71. Form of Agreement.-The contract shall be executed in substantial conformance with Exhibit E. [See also Article E-1]

EXHIBITS FOLLOW

EXHIBIT A

SPECIMEN

NON-INFLUENCE AFFIDAVIT

COUNTY OF _____

STATE OF _____

I do solemnly swear on my oath that as to the contract dated_____, 20_____,

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

_____
Notary Public

My Commission expires _____

his_____ day of _____, 20____.

EXHIBIT B

SPECIMEN

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 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 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 hereinbelow:.....

[Instructions-ENTER THE WORD "NONE" OR LIST THE NAMES OF CLAIMANTS AND THE AMOUNT CLAIMED BY EACH]

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

_____
Notary Public

My commission expires _____

This _____ day of _____, 20_____.

EXHIBIT C

SPECIMEN

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That _____ as principal (hereinafter referred to as
(Legal Name and Address of the Contractor)

"Contractor"),and _____ as surety
(Legal Title and Address of Surety)

(hereinafter referred to as "Surety"), are held and firmly bound unto Gordon College as Obligee (hereinafter referred to as "Owner"), in the amount of _____

_____ DOLLARS ($_____), 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 _____for:_____
(Here insert Name of Work)

in accordance with drawings and specifications prepared by: _____ which
(Full Name and Title)

said contract is incorporated herein by reference and made a part hereof, and is hereinafter referred to as he 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 E-19(b)(2) or E-21, shall in any wise 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.

(2) If pursuant to the Contract Documents the Contractor shall be declared in default by the Owner under the aforesaid Contract, the Surety may promptly perform the Contract in accordance with its terms and conditions. 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 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) Supplementary to and in addition to the foregoing, whenever the Owner shall notify the Surety that the Owner has notice that the Contractor has failed to pay any subcontractor, materialman, or laborer for labor or materials certified by the Contractor as having been paid for by the Contractor in accordance with said Contract, which said laborer or materials have been included in a periodical estimate and certified by the Architect for payment and paid for by the Owner, the Surety shall, within 20 days of receipt of such notice, cause to be paid any unpaid amounts for such labor and materials.

(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 sub-contractors, laborers, materialmen, or other parties concerning the status of payments for labor, materials, or services furnished in the prosecution of the work.

(5) 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.

(6) For the purposes of this bond, the name and address of the Authorized State of Georgia Licensed Agent to whom correspondence and telecommunications may be addressed and/or with whom business concerning this bond may be conducted will be as follows:

(7) Further, this bond shall be the Performance Bond furnished under O.C.G.A. Section 13-10-1 and Section 36-82-101.

_____
NAME

ADDRESS_____
CITY STATE ZIP CODE

_____
TELEPHONE

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

IN THE PRESENCE OF:

_____ _____(SEAL)
WITNESS PRINCIPAL

_____
NAME TITLE

_____ _____(SEAL)
WITNESS SURETY

_____
NAME TITLE

EXHIBIT D

SPECIMEN

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

That_____ as Principal (hereinafter referred to
(Legal Title and Address of the Contractor)
as "Principal") and _____
(Legal Name and Address of the Surety)
as Surety (hereinafter referred to as "Surety"), are held and firmly bound unto Gordon College as Obligee (hereinafter referred to as "Owner") for the use and benefit of claimants defined, hereinafter in the amount of:_____DOLLARS ($_____)to which
(Insert Contract Price)
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 _____for _____
(Insert Name of Work)
in accordance with the drawings and specifications prepared by:_____
(Here insert Full Name and Title)
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 E-19(b)(2) or E-21, shall in any wise 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.

(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 subcontract, but no contractual relationship express or implied with the Contractor furnishing said payment bond upon giving 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 from whom the labor was performed or done; 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, registered 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 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 fee which the clerks of the superior courts are permitted to charge for similar copies.

(4) No action can be instituted on this bond after one year from the date of the final certificate of the Architect.

(5) Further, this bond shall be the Payment Bond furnished under O.C.G.A. Section 13-10-1 and Section 36-82-101.

(6) For the purposes of this bond, the name and address of the Authorized State of Georgia Licensed Agent to whom correspondence and telecommunications may be addressed and/or with whom business concerning this bond may be conducted will be as follows:

_____
NAME

_____
ADDRESS

_____
CITY STATE ZIP CODE

_____
TELEPHONE NUMBER

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

IN THE PRESENCE OF:

_____ _____(SEAL)
WITNESS PRINCIPAL

_____
NAME TITLE

_____ _____(SEAL)
WITNESS SURETY

_____
NAME TITLE

EXHIBIT E
SPECIMEN

FORM OF AGREEMENT BETWEEN CONTRACTOR AND OWNER

THIS AGREEMENT made the _____ day of _____ in the year Two Thousand and _____ by and between contractor and address _____ hereinafter called the Contractor, and Gordon College hereinafter called the owner,

WITNESSETH, That the contractor and the owner for the considerations hereinafter named agree as follows:

1. SCOPE OF THE WORK. -- The contractor shall furnish all of the materials and perform all of the work shown on the drawings or described in the specifications entitled (project name) _____ prepared by (architect) acting as and in these contract documents entitled the architect; and shall do everything required by this agreement, the general conditions of the contract, the specifications and the drawings.

2. TIME OF COMPLETION. -- The work to be performed under this contract shall be commenced (as provided in specifications) and shall be completed (number of days of completion) .

3. THE CONTRACT SUM. -- The owner shall pay the contractor for the performance of the contract, subject to additions and deductions provided by approved change order (See Article E-15), in current funds as follows:

4. PROGRESS PAYMENTS. -- The owner shall make progress payments on account of the contract as follows: On or about the 15th day of each month 90 per cent of the value, based on the contract prices, of labor and materials incorporated in the work and of materials suitably stored at the site thereof up to the 1st day of that month, as estimated by the architect, less the aggregate of previous payments, until one-half of the contract sum is due. At any time after one-half of the contract sum, including change orders, becomes due and the work is . . .

(a) On or ahead of the construction progress schedule; and

(b) There are no breaches of orders of condemnation; and

(c) There is no delinquency in the filing of the final breakdown and accounting, together with vouchers, on force account work as referred to in Subparagraphs (k) and (n) of Article E-15 of the general conditions.

if the contractor requests and the architect approves, the sum being withheld as retainage will be converted to a lump sum and held by the owner until the final completion. No further retainage will be withheld by the owner from payments to the contractor unless:

Event (a) The percentages of work complete as set forth in Column (8), Line D, of Form 36-3 falls behind the percentage required by the construction progress schedule by as much as 15 per cent; or

Event (b) The contractor breaches an order of condemnation; or

Event (c) The contractor becomes delinquent in regard to the filing of the final breakdown and accounting, together with vouchers, on force account work as referred to in Subparagraphs (k) and (n) of Article E-15 of the general conditions,

in which event or events the owner shall reinstate the 10 per cent retainage on all periodical estimates due to be paid while one or more of the events continues to exist. The contractor will be given written notice of the reinstatement of the retainage. If the contractor . . .

(a) Recovers all lost time and puts the work back on schedule; and

(b) Remedies all breaches of orders of condemnations; and

(c) Supplies a proper breakdown and accounting on force account work

the sums withheld while either or all of the events existed will be converted to an additional lump sum and held by the owner until final completion, and no further retainage will be withheld unless:

(1) Event (a) recurs, or

(2) Event (b) recurs, or

(3) Event (c) recurs

in which event or events the owner shall reinstate the 10 per cent retainage on all subsequent periodical estimates. At the discretion of the owner, the retainage of each subcontractor may be released separately as he completes his work. An application for release of a subcontractor's retainage shall bear the original certificates of the subcontractor, the contractor, and the architect that the subcontractor's work has been fully performed and that the sum for which payment is requested is due by the contractor to the subcontractor. Checks releasing a subcontractor's retainage shall be made payable to the contractor, the contractor's surety, and the subcontractor and shall be mailed to the contractor's surety. This article does not create any contractual relationship between the owner and the subcontractor or any duty of the owner to any subcontractor. All warranties shall run from the date of the final certificate of the architect unless otherwise expressly provided in the contract. Payments pursuant to this article shall in no way diminish, change, alter or affect the rights of the owner under the contract documents.

5. FINAL PAYMENT. -- (a)-Final payment shall be due 30 days after execution of the final certificate by the architect, provided that all other requirements of the contract shall have been met in full. Final payment shall be made by a check payable jointly to the contractor and surety and shall be mailed to the surety.

(b)-Upon receipt of written notice from the contractor pursuant to Article E-41 of the general conditions that the work is ready for final inspection, the architect shall promptly make such inspection, and when he finds the work complies with the contract and when the contract shall have been fully performed he shall promptly issue a final certificate, over his own signature, stating that the work provided for in this contract has been completed under the terms and conditions thereof, and that the entire balance found to be due the contractor, and noted in said final certificate, is due and payable.

(c)-Before issuance of final certificate, the contractor shall submit evidence satisfactory to the architect that all payrolls, material bills, and other indebtedness connected with the work have been paid.

(d)-If full completion of the work is materially delayed through no fault of the contractor, and the architect so certifies, the owner shall, upon certificate of the architect, and without terminating the contract, make payment of the balance due for that portion of the work fully completed. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of payment for incomplete work.

6. THE CONTRACT DOCUMENTS -- The general conditions of the contract, the specifications, the drawings, the signed bid form, and the notice of acceptance of the said bid together with this agreement form the contract, and they are as fully a part of the contract as if hereto attached or herein repeated. The drawings and specifications shall be identified by the architect pursuant to the general conditions.

7. BONDS. -- The contractor shall furnish both a performance bond and a payment bond and shall pay the premium thereon. The performance bond shall guarantee the full performance of the contract.

8. The Owner and the CONTRACTOR hereby agree to the full performance of all the conditions and stipulations contained herein.

9. This Agreement and all rights, privileges and responsibilities shall be interpreted and construed according to the laws of the State of Georgia.

10. The CONTRACTOR covenants that it presently has no interest and shall not acquire any interest, direct or indirect, which would conflict in any manner or degree with the performance required under this Agreement. The CONTRACTOR further covenants that in the performance of this Agreement, no person having any such interest shall be employed or contracted with.

11. 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 Section 45-10-20 through 45-10-26 of the O.C.G.A. have not and will not be violated in any respect in regard to this Agreement.

12. This Agreement and the proceeds of this Agreement may not be assigned nor may the performance thereunder be assigned, without the prior written consent of the Owner.

13. 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 recession of the Contract itself.

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

ATTEST: (*) (CONTRACTOR)

_____ By:_____

(NAME), Secretary (Name), President

ATTEST: (GORDON COLLEGE)

_____ By: _____

(NAME) Secretary Richard Vereen, Director of Plant Operations

(*) Please apply seal of Corporation

EXHIBIT F

INSTRUCTIONS TO PRODUCING AGENT: COMPLETE THE SHADED PORTIONS OF THIS CERTIFICATE AND RETURN TO THE INSURED. 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.**:, **NAME, AND LOCATION**: *(Owner to fill this information in before sending to contractor)*
Name and Address of Insured Contractor	**Certificate Holder(Owner)**: Gordon College

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				General Aggregate 2,000,000.00 (per project) Products-Co./Op Agg 1,000,000.00 Personal & Adv injury 1,000,000.00 Contractual $1,000,000.00 Each Occurrence 1,000,000.00
Commercial Business Automobile Liability Including, but not limited to, owned, hired and non-owned autos				Combined Single Limit 1,000,000.00 **OR** Bodily Injury $1,000,000.0 (per person) Property Damage $1,000,000.00
Workers Compensation The Proprietor/Partners/ Executive Officers are included				W C Statutory Limits
Employers☐Liability				Each Accident 1,000,000.00 Disease - Policy Limit 1,000,000.00 isease - Each Employee $1,000,000.00
Commercial Umbrella Liability				Each Occurrence 2,000.000.00 Aggregate 2,000,000.00
Builders Risk written on 1991 Cause of Loss-Special Form or its equivalent(See endorsement below) OR **Installation Floater** (for other than new construction)				$ *(NOTE: THIS AMOUNT TO BE FILLED IN BY OWNER-CONTRACT AMOUNT)*

Such insurance as is herein certified (I) applies to all questions of said insured in connection with the work required by the provisions of the documents forming the contract, (ii) applies whether or not the contract documents between the insured contractor and the Owner have been executed, (iii) is written in accordance with the company's regular policies and endorsements, subject to the company's applicable manuals or rules and rates in effect, as modified by this certificate and the insurance article of the contract, (iv) have been issued to the insured named above, and (v) are in force at this time.

The Officers, Members, Agents, & Employees of the Owner and the State of Georgia are included as additional insureds as their interests may appear. Each Insurer is hereby notified that the statutory requirement that the Attorney General of Georgia shall represent and defend the Indemnities remains in full force and effect and is not waived by issuance of any policy of insurance.

The Builders Risk policy has been endorsed as follows: ☐The following may occur without diminishing, changing, altering or otherwise affecting the coverage and protection afforded the insured under this policy: (I) Furniture and equipment may be delivered to the insured premises and installed in place ready for use; and (ii) Partial or complete occupancy by Owner; and (iii) Performance of work in connection with construction operations insured by the Owner, by agents or lessees or other contractors of Owner, or by contractors or the lessee of the Owner.☐

Each policy has been endorsed to provide that the policy shall not be canceled, changed, allowed to lapse, or allowed to expire for any reason, including without limitation non-payment of premiums, until forty-five (45) days after Owner has received written notice thereof as evidenced by return receipt of registered letter.

Authorized Representative: _____ Date: _____

Typed Name: _____

Form No. 567

EXHIBIT G

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 architect 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.[See "Definitions" set forth on the last page of this specimen]. 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 E-53 of the General Conditions], 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 hereinbelow by the representative of the manufacturer.

Date:_____

Gordon College
Plant Operations
419 College Drive
Barnesville, Georgia 30204

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 or improvement 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

[Attachment-Copy of contract provision-(Article E-67)]

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.

Exhibit H

GEORGIA SECURITY AND IMMIGRATION COMPLIANCE ACT AFFIDAVIT

Project No. and Name: _____

_____

Construction Professional: _____

STATE OF GEORGIA;

COUNTY OF _____:

CONTRACTOR AFFIDAVIT

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 contracting with the Gordon College has registered with and is participating in a federal work authorization program*, in accordance with the applicability provisions and deadlines established in O.C.G.A. 13-10-91.

The undersigned further agrees that, should it employ or contract with any subcontractor(s) in connection with the physical performance of services pursuant to this contract with the Gordon College , Contractor will secure from such subcontractor(s) similar verification of compliance with O.C.G.A. § 13-10-91 on the Subcontractor Affidavit provided in Rule 300-10-01-.08 or a substantially similar form. Contractor further agrees to maintain records of such compliance and provide a copy of each such verification to the Gordon College at the time the subcontractor(s) is retained to perform such service.

_____
EEV / E-Verify™ User Identification Number

_____ _____
BY: Authorized Officer or Agent Date
(Contractor Name)

_____
Title of Authorized Officer or Agent of Contractor

_____
Printed Name of Authorized Officer or Agent

SUBSCRIBED AND SWORN
BEFORE ME ON THIS THE

_____ DAY OF _____, 200_

_____ [NOTARY SEAL]
Notary Public

My Commission Expires:

SECTION F - SPECIAL CONDITIONS

F-01 OMITTED

F-02 OMITTED

F-03. 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-04. Inspection of Existing Facilities prior to Commencing Work.

A. The Contractor shall give a 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 a 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 was not ascertainable by visual inspection or which was not the 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.

F-05. Indoor Air Quality. 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-06. Off-Site Storage of materials. Materials shall not be stored off site.

F-07. OMITTED

F-08. OMITTED

F-09. OMITTED

F-10 OMITTED

F-11. OMITTED

FORM NO. F-1

GENERAL CONTRACTOR AFFIDAVIT

1. THIS IS TO CERTIFY pursuant to specification F-01.0 that [insert name of General Contractor], has demonstrated proficiency in the construction of **variable air volume systems utilizing DDC controls** by the successful performance of such work on at least **three (3) similar** projects in the last five years, the foregoing installations having been the complete and undivided responsibility of aforesaid General Contractor. The two installations referred to above are:

   {List the three projects, showing project name and address of each, attaching a letter on official owner letterhead from the contact person responsible for projects verifying quality of performance for the project on which the contractor worked, date of completion and current performance of building.}

   (1) Name/Type of Project_____
   Total Construction Contract Amount_____
   Date of Completion_____
   Contact Name_____
   Phone No._____

   (2) Name/Type of Project_____
   Total Construction Contract Amount_____
   Date of Completion_____
   Contact Name_____
   Phone No._____

   (3) Name/Type of Project_____
   Total Construction Contract Amount_____
   Date of Completion_____
   Contact Name_____
   Phone No._____

2. THE CERTIFICATIONS of the affiant are not mere declarations but are in consideration of and in fulfillment of express contractual requirements established in the bidding documents for this project.

3. THIS AFFIDAVIT applies to this project.

   This _____ day of _____,20___.

Name of Company:_____

By: _____
Title:_____

CERTIFICATE OF NOTARY PUBLIC

Sworn and subscribed to before me, an officer authorized to administer oaths.
This ____ day of _____, 20___
Notary Public:_____
My Commission expires: _____

Attachments: Attach letters verifying quality of performance.

FORM NO. F-2

INDIVIDUAL SUBCONTRACTOR QUALIFICATION AFFIDAVIT
(To be subscribed and sworn to before a notary public)

LISTED SUBCONTRACTOR Division_____

AFFIDAVIT

1. THIS IS TO CERTIFY that_____(subcontractor's company name), proposed subcontractor for_____

(scope of work) for Project No._____is qualified for the work of the above Division(s) and meet the qualifications cited in Specification Section(s)_____, Paragraph(s)_____.

2. THE CERTIFICATIONS of the affiant are not mere declarations, but are in consideration of and in fulfillment of express contractual requirements established in the bidding documents for this project.

3. THIS AFFIDAVIT applies to: PROJECT NO.

This _____day of_____, 20__.

General Contractor_____

By_____

Title (must be an officer of the company)_____

CERTIFICATE OF NOTARY PUBLIC

Sworn and subscribed to before me, an officer authorized to administer oaths.

This_____day of_____20__.

_____
Notary Public

My commission expires on_____
Seal

END OF SECTION

SECTION G - SCHEDULE OF DRAWINGS

T1	Title Sheet
M1	Mechanical Demolition Plan - First and Second Floor
M2	Mechanical New Work Floor Plan - First and Second Floors
M3	Mechanical Legend, Schedules and Details
E1	Electrical New Work Plan - First and Second Floors

All drawings are dated June 18, 2012

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 "Submittals."

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 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:

1. Pre-Construction Conference.
2. Coordination Meetings.
3. Progress Meetings.

B. Construction Schedules are specified in another Division-1 Section.

1.2 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction conference and organizational meeting at the project site or other convenient location no later than 10 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities, personnel assignments and phasing plan.

B. Attendance: The Owner, Architect and their consultants, and the Contractor and its superintendent, major subcontractors, manufacturers, supplier and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.

C. Agenda: Discuss items of significance that could affect progress including such topics as:

1. Tentative construction schedule.
2. Critical work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of Shop Drawings, Product data and samples.
8. Preparation of record documents.
9. Use of the premises.
10. Office, work and storage areas.
11. Equipment deliveries and priorities.
12. Safety procedures.
13. First aid.
14. Security
15. Housekeeping.
16. Working hours.
17. Project close-out procedures.

D. The Architect shall provide copies of the minutes of the meeting to all attendees.

1.3 PROGRESS MEETINGS

A. The Architect shall conduct monthly and "as-needed" progress meetings at the project site.

B. Attendees: In addition to representatives of the Owner and Architect, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of futures activities shall be represented at these meetings by persons familiar with the project and authorized to conclude matters relating to progress.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.

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

    a. Interface requirements.
    b. Time
    c. Sequences.
    d. Deliveries.
    e. Off-Site fabrication problems.
    f. Access.
    g. Site utilization.
    h. Temporary facilities and services.
    i. Hours of work.
    j. Hazards and risks.
    k. Housekeeping.
    l. Quality and work standards.
    m. Change Orders.
    n. Documentation of information for payment requests.

D. Schedule Updating: Revise the construction schedule after each progress meeting when revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

END OF SECTION 01200

SECTION 01500 - CONSTRUCTION FACILITIES & TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection. These requirements have been included for special purposes as indicated. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized as an indication by Architect that such temporary activity is not required for successful completion of the work and compliance with requirements of Contract Documents.

1. Temporary utilities include, but are not limited to, the following:

    a. Telephone service.

2. Support facilities include, but are not limited to, the following:

    a. Waste disposal services.
    b. Sanitary facilities.
    c. Drinking water.
    d. Construction aids and miscellaneous services and facilities.

3. Protection of existing facilities include, but are not limited to, the following:

    a. Access for fire protection.
    b. Barricades, warning signs, and lights.
    c. Building enclosure/lockup.
    d. Sidewalk bridge or enclosure fence for the site.
    e. Environmental protection, including silt fencing.

1.2 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations including, but not limited to, the following:

1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department, and rescue squad rules.
5. Environmental protection regulations.

B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."

C. Conservation: In compliance with Owner's policy on energy/materials conservation, install and operate temporary facilities and perform construction activities in manner which reasonably will be conservative and avoid waste of energy and materials including water.

1.3 PROJECT CONDITIONS

A. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

B. Access Provisions: Provide ramps, stairs, ladders and similar temporary access elements as reasonably required to perform the work and facilitate its inspection during installation. Comply with reasonable requests of governing authorities performing inspections. When permanent stairs are available for access during construction, cover finished surfaces with sufficient protection to ensure freedom from damage and deterioration at time of Architect=s Final Certificate.

C. Living Quarters: No temporary living quarters of any kind will be permitted on Project Site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

B. Lumber and Plywood:

1. For signs and directory boards, provide exterior-type, Grade B-C plywood, sanded both sides, of sizes and thicknesses indicated.
2. For fences and vision barriers, provide minimum 3/8-inch- (9.5-mm-) thick exterior plywood.
3. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch-(16-mm-) thick exterior plywood.

C. Open-Mesh Fencing: Provide 0.120-inch- (3-mm-) thick, galvanized 2-inch (50-mm) chain link fabric fencing 6 feet (2 m) high with galvanized barbed-wire top strand and galvanized steel pipe posts, 1-1/2 inches (38 mm) I.D. for line posts and 2-1/2 inches (64 mm) I.D. for corner posts. If acceptable to Architect, pressure treated wood post may be used.

2.2 EQUIPMENT

A. General: Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

1. Water Hoses: Provide 3/4-inch (19-mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet (30 m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
2. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
3. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

B. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.

C. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

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

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

1. Arrange with Owner for a time when service can be interrupted, if necessary, to make connections for temporary services.
2. Contractor may use existing utilities in existing buildings.
3. Contractor shall provide temporary toilet facilities. Contractor=s personnel shall not use toilet facilities in existing buildings.

B. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect. Neither the Owner nor Architect will accept cost or use charges as a basis of claims for Change Orders.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.

D. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.

3.3 SUPPORT FACILITIES INSTALLATION

A. Locate storage sheds, and other temporary construction and support facilities for easy access.

B. Maintain support facilities until near Architect=s Final Certificate. Remove prior to Architect=s Final Certificate. Personnel remaining after Architect=s Final Certificate will be permitted to use permanent facilities, under conditions acceptable to the Owner.

C. Sanitary facilities include temporary toilets. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

1. Provide toilet tissue, paper towels, and similar disposable materials for each facility. Provide covered waste containers for used material.

D. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

1. Provide separate facilities for male and female personnel.

E. Drinking-Water Facilities: Provide containerized, tap-dispenser, bottled-water drinking-water units, including paper supply.

F. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Contractor shall provide security for his materials, tools, work, etc. Coordinate security in existing buildings with Gordon College.

B. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Architect=s Final Certificate, or longer, as requested by the Architect.

C. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell. Post warning and quick-instructions at time of personnel's first arrival, on proper use of extinguishers. Post local Fire Department call number on each telephone instrument at project site.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.

E. Security Enclosure and Lockup: At earliest possible date, secure building against unauthorized entrance at times when personnel are not working. Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

F. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

G. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Architect=s Final Certificate. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.

END OF SECTION 01500

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. All copper wiring shall be removed by the Contractor and shall remain the property of the Owner and stored at Owner's direction. All other materials, items and debris shall become the property of Contractor and removed from site.

G. 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

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. Provide submittals in accordance with Section 01330 - Submittal Procedures.

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

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

D. 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.

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

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

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

H. 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:

I. HVAC Submittal Data

1. Section 15060 - Hangers and Supports

    a. Upper attachments
    b. Pipe attachment (hangers and clamps)
    c. Metal framing channel

2. Section 15075 - Mechanical Identification

    a. Pipe markers.

3. Section 15080 - Mechanical Insulation

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

4. Section 15110 - Valves

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

5. Section 15122 - Meters and gauges

    a. Pete's (P & T) plugs.

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. Manual air vents
    d. Strainers
    e. Flexible pipe connectors
    f. Pressure compensating flow control valve
    g. Pressure relief valves

7. Section 15815 - Metal Ducts

    a. Medium pressure supply ducts and fittings
    b. Note Concerning Duct Shop Drawings: The Contractor may generate ductwork shop drawings for their use in coordination with structural, sprinkler, electrical, plumbing, etc., but these are not required for submittal review and shall not be submitted to the Engineer for review.

8. Section 15820 - Duct Accessories

    a. Low pressure flexible ducts.
    b. Medium pressure flexible ducts.

9. Section 15840 - VAV Boxes and Fan Powered Boxes

    a. VAV terminal units

10. Section 15900 - HVAC Instrumentation and Controls

    a. Control Product Data
    b. Sequence of Control

11. Section 15950 - Testing, Adjusting, and Balancing

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

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

J. 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.

K. 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.

L. 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.

M. 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.

N. 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. City of Barnesville and Lamar County Codes

6. Requirements of the State of Georgia Fire Marshall's Office.
7. ASHRAE 62.1 - 2004, Ventilation for Acceptable Indoor Air Quality.
8. ASHRAE 15, Safety Code for Mechanical Ventilation.
9. GA State Minimum Standard Energy Code.

B. Obtain and pay for all permits, and request inspections from all authorities having jurisdiction, in a timely manner.

C. 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.

D. 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. Install one VAV box complete for review by the Engineer and Owner prior to the installation of remaining units.

D. 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.

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 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 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.

1.12 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 air filters and liquid strainers until Final Certificate. 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.

1.13 AIR HANDLING EQUIPMENT OPERATION DURING CONSTRUCTION PERIOD

A. For the purpose of this paragraph, air handling equipment shall include, but is not limited to, air moving equipment such as fan coil units, rooftop air conditioning units, central station air handling units, water source heat pumps, wall hung air conditioners, PTAC units, etc. Air handling equipment shall not be operated for space heating or cooling or air filtering during construction. Equipment shall be operated only to provide start up, check out, balancing, testing etc., in order to meet “Substantial Completion” goals and provide a complete working system to turn over to Owner. If air handling equipment must be operated during construction to “dry out” the building or to maintain temperature conditions required by flooring, paint, or other building compartment products, mechanical contractor shall have written permission from General contractor and Owner prior to operating.

B. Permanently installed air handling equipment used during construction shall not be operated during sanding, masonry cutting, or other operations generating airborne particulate. Where air handling equipment is utilized during construction, units shall be provided with filtration media with a minimum efficiency reporting value (MERV) of 8 at each return grille/duct as determined by ASHRAE 52.2-1999. Air filtration shall be replaced as specified prior to Occupancy. If air handling cooling/heating coils are found to be overloaded with dirt/dust it shall be the mechanical contractor’s responsibility to clean coils to insure maximum performance. If equipment must be operated during these activities mechanical contractor shall have written permission from General contractor and Owner prior to operating.

C. Permanently installed supply duct and air handling equipment conveying 65°F or less supply air shall be insulated as specified and building construction shall be near completion (tightly sealed) prior to operating air handling equipment. This requirement is included to limit the possibility of condensation on ductwork, HVAC equipment, grilles, building structure, etc., especially in the presence of uncontrolled outdoor air entering the building prior to sealing. Mechanical contractor shall be responsible for any damage caused by duct/equipment condensation (e.g. insulation, building materials, flooring etc.). If equipment must be operated prior to duct insulation and vapor barrier on ducts/equipment being complete and building sealing not finalized, mechanical contractor shall have written permission from General contractor and Owner prior to operating.

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 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 to match existing. Supports, hangers and accessories exposed to view shall not be electroplated, in order to allow them to be painted. Painting shall be done under this division of the specifications in accordance with the requirement of ANSI A13.1.81.

1.16 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.

1.17 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).

1.18 ACCESS PANELS

A. Some mechanical systems may be made inaccessible by the installation of "hard" ceilings or by walls above the ceiling. See the finish schedule and the floor plans (architectural drawings) for the location of all "hard" ceilings and walls which extend above the ceiling. Provide access panels in these ceilings or walls (and any other locations where mechanical items are made inaccessible by ceilings or walls) for access to mechanical equipment and items requiring access above these ceilings.

B. For all access panels in gyp board and masonry, provide in accordance with specification section 08311 - Access Doors and Frames.

C. For all access panels in masonry, construction shall be as follows: Panels shall be sized as required for proper access and removal of the equipment but as a minimum shall be 18" x 18". Access panels shall have concealed continuous hinge, flush (not recessed) door, 14 gauge galvanized steel frame with prime coated finish, with pre-drilled anchor holes in corners, 1/4 turn flush mounted screwdriver operated latch(es) (on maximum 8" centers) and 14 gauge steel door with prime coated finish and rounded corners. Entire panel shall be painted to match ceiling or wall. Provide fire-rated access panel where required. Access panels shall be manufactured by Venco Products, Inc., Elmdor or Cesco.

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. 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. 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.

B. Asbestos Containing Materials to Remain: The Owner may elect not to remove ACMs which are not 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. O&M Instruction Form.

I. Maintenance and Service.

J. Completion of Work.

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

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.

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 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

1.11 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			
VAV Boxes			
"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:			

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. Metal framing channel
5. Hanger rods
6. Insulation shields

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, metal framing channel, 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

C. Steel Beams:

1. Piping 2" and smaller: Malleable Iron C-Clamp with Lock Nut.

a. B-Line: B 3036L
b. C&P: 196
c. Anvil: 86
d. Erico/Michigan: 255L
e. PHD: 270-1

2. Piping 2-1/2" and larger: Malleable Iron Beam Clamp.

a. B-Line: B 3054
b. C&P: 82
c. Anvil: 218
d. Erico/Michigan: 360
e. PHD: 630 w/25

D. Steel Bar Joist: Malleable Iron C-Clamp with Lock Nut.

1. B-Line: B 3036L
2. C&P: 196
3. Anvil: 86
4. Erico/Michigan: 255L
5. PHD: 270-1

2.2 PIPE ATTACHMENT

A. 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

2.3 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. 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.

C. 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.

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

2.4 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

2.5 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

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.

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 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.

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.
3. Some specific pieces of equipment or controls are identified as having equipment markers with customized messages. These include the following, and the customized messages are identified on the floor plans:

a. Boiler Emergency Shutdown Switches
b. Plate and Frame Heat Exchanger Connections
c. Laboratory Exhaust Fans

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. Heating hot water

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"

2.4 VALVE TAGS

A. Provide valve tags for all valves (domestic water, HVAC and fire protection).

B. Designation: The number of each valve shall be stamped in 1/2" high letters and shall be black-filled. Numbers shall begin at (200.) (DESIGNATE NUMBER)

C. Material: Valve tags shall be manufactured from 19 gauge brass and shall be 2" in diameter with a brass "S" hook and brass "jack chain" to fasten to valve.

D. Valve Chart: Contractor shall furnish a valve chart listing all valves by number with location, type of service, normally open or normally closed, and shut off or balance. Frame valve chart under plastic (plexiglass) and mount as directed by the Owner.

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 VAV box
2. Each group of piping isolation valves for heating hot water systems. (Hot water shut off valves at each VAV box are not required to have bakelite labels since these pieces of equipment are already specified with bakelite labels).

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.

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. 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, 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. ASJ jacket shall be continuous. Provide insulation shield on exterior of insulation at all hangers.

B. 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.

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.

2.4 ACCESSORIES

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

B. Metal Jacket Bands: 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. Continue insulation with vapor barrier through penetrations. At fire dampers, smoke dampers, and fire/smoke dampers, extend insulation to wall on both sides of wall and seal.

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

K. 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.

L. Insure duct access panels are not blocked by the installation of external duct insulation.

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

N. Internal Acoustical duct liner is specified in certain ducts for acoustical purposes to reduce high frequency noise. These ducts may also be specified with external duct insulation. The Contractor is not permitted to omit specified external duct insulation (duct wrap, duct board, etc.) just because the duct is also lined.

3.4 INSULATION SCHEDULE

A.

	INSULATION			FINISH	
Service/Location	**Pipe/Duct**	**Fitting**	**Thickness**	**Pipe/Duct**	**Fitting**
PIPING:					
Space Heating Hot Water Piping:					
Concealed, 1/2" to 1"	I1	P1	1/2"	--	B
Concealed, 1-1/4" to 2"	I1	P1	1"	--	--
Run Outs to Terminal Units	I1	P1	1/2"	B	B
DUCT:					
Supply Duct Concealed or in Mechanical Room	I3	I3	2"	--	--

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. Ball valves with electric actuation.
3. Gate valves.
4. 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. Ball Valves: 2" and smaller; 400 psi WOG; full port, 3-pc. construction, blow-out proof stem, solder or threaded ends as applicable. Provide teflon (TFE) packing and packing nut to allow stem leakage correction. "O" ring seals are not allowed. Provide a stem extension on insulated piping. Valve shall conform with MSS-SP110. Length of extension shall be 2-1/4".

   a. Nibco: S-595-Y
   b. Apollo: 82
   c. Hammond: 8614
   d. Pittsburg: SP-B
   e. Watts: B6800
   f. Milwaukee: BA350
   g. Kitz: 62-63
   h. Stockham: S-395, T-395

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 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

2.4 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. 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.

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

H. Use ball valves 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. Pete’s (P & T) plugs.

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 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, Palmer or Weksler.

PART 3 - EXECUTION

3.1 INSTALLATIONS

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

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

C. All gauges, flow meters, 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 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. Pressure relief valve-inlet and -outlet piping.
3. Automatic air vents
4. Tangential type air separators
5. Strainers
6. Flexible pipe connectors
7. Pressure compensating flow control valves
8. Calibrated venturi/ball valves
9. Pressure relief valves
10. Manual air vents

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.

F. Pipe Run Outs to VAV Boxes and Piping 2" and Smaller: These run outs may be type L hard drawn copper, ASTM B88. Fitting: ANSI/ASME B16.9 pressure pattern wrought copper. Joints: ANSI/ASTM B32 lead free solder, , as specified herein.

2.2 RELIEF VALVE DISCHARGE AND DRAIN PIPING

A. Utilize same piping material as specified for the medium being discharged.

2.3 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.

2.4 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.

2.5 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.

2.6 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.

2.7 AIR CONTROL DEVICES

A. 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.

2.8 HYDRONIC PIPING SPECIALTIES

A. Strainers:

1. Y-Type, 2-1/2" and Smaller:

    a. Threaded or soldered connections, cast bronze, 200 psi WOG at 150°F. Basis of design is Watts 777.
    b. At VAV boxes, contractor has the option of using a combination Y-strainer and ball valve. Provide threaded or soldered connections, forged brass, 400 psig at 250°F. Ball valve shall have Teflon packing, brass packing nut and stem, full size steel handle with vinyl grip, and union connection on discharge.

2. 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.
3. 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.
4. 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.
5. 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, Nexus, Bell and Gossett, Griswold or Parts Service Inc.

B. 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.

C. 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. 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., Hydronic Components, Inc. (HCI), Bell & Gossett, or Flow Design.
3. See Section 15051 for warranty information.

D. 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, Bell & Gossett, Hydronic Components, Inc. (HCI), Griswold or Parts Service, Inc.

2.9 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.

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 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.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. 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.

K. 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.

L. Establish inverts and install piping at a uniform grade of 0.2 percent upward in direction of flow for non-gravity systems.

M. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

N. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

O. Install valves according to Division 15 Section "Valves."

P. Install unions or grooved joint couplings in piping**,** NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

R. 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.

S. Identify piping as specified in Division 15 Section "Mechanical Identification."

T. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

U. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

V. 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.

3.2 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
8. NPS 6: Maximum span, 10 feet; minimum rod size, 3/4 inch.
9. NPS 8: Maximum span, 10 feet; minimum rod size, 7/8 inch.
10. NPS 10: Maximum span, 10 feet; minimum rod size, 7/8 inch.
11. NPS 12: Maximum span, 10 feet; minimum rod size, 7/8 inch.
12. NPS 14: Maximum span, 15 feet; minimum rod size, 1 inch.
13. NPS 16: Maximum span, 15 feet; minimum rod size, 1 inch.
14. NPS 18: Maximum span, 15 feet; minimum rod size, 1-1/4 inches.
15. NPS 20 to NPS 24: Maximum span, 15 feet; minimum rod size, 1-1/2 inches.

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 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 1/2 inch.
7. NPS 3 to NPS 5: Maximum span, 10 feet; minimum rod size, 1/2 inch.

D. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions and also maximum span of five feet. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.

E. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

F. Install a hanger within 12-inches of each horizontal elbow.

3.3 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. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join ASTM D 1785 schedule number, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.

J. 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.

3.4 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. Vent and purge air from hydronic system, and ensure expansion tank is properly charged with air to suit system Project requirements.

3.5 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."

3.6 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.

3.7 PAINTING

A. All bare steel piping exposed to view provided under this section of specifications, shall be cleaned and painted to match existing.

3.8 WATER SYSTEM START-UP AND TREATMENT

A. Contractor shall valve off the existing piping system so that water system start up and treatment occurs only for new piping system. After pressure testing piping (by means of temporary portable pumps) and correction for any piping leaks associated with the piping joints that the contractor has installed, the new piping system shall be thoroughly flushed of all foreign matter and debris. (Use of existing pumps for flushing and cleaning is prohibited because it will contaminate the existing system.) The shutoff valves at each piece of equipment shall be closed prior to flushing to prevent debris from entering the coil on equipment that uses two way valves or no control valve. On equipment equipped with three-way valves, the valves shall be positioned to the fully bypassed position prior to flushing to prevent debris from entering the coil. The new piping system shall be filled with fresh water and the temporary portable pumps shall be started to circulate the water. System strainers shall be checked frequently and cleaned as needed. If the water is extremely dirty, the system shall be continuously flushed using the make-up water station and discharging to a drain. Once the system water is clear, the temporary portable pump shall be stopped, valves opened to the coil, and the entire new system re-filled using fresh water and adding a cleaning agent such as trisodium phosphate (TSP). Circulate this solution throughout the new piping system and continue to operate 3 hours. Then turn off the system pump and refill with fresh water. Add chemical treatment. Provide 48 hour prior notice to Architect to allow Owner/Engineer to witness the water system start up and treatment.

B. 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 15815 - METAL DUCTS

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 metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch w.g. Metal ducts include the following:

1. Low pressure galvanized steel ducts
2. Medium pressure supply ducts and fittings

1.3 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select the air-moving equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.4 SUBMITTALS

A. Submit product data under provisions of Section 15050 for duct liner, single wall exposed round duct, double wall exposed spiral round duct, medium pressure supply ducts and fittings. The Contractor may generate ductwork shop drawings for their use in coordination with structural, sprinkler, electrical, plumbing, etc., but these are not required for submittal review and shall not be submitted to the Engineer for review.

1.5 QUALITY ASSURANCE

A. Construct ductwork to 2006 International Mechanical Code.

B. Construct ductwork to ASHRAE Handbook.

C. Fabricate ductwork in accordance with SMACNA HVAC Duct Construction Standards.

D. NFPA Compliance:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

E. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Ch. 3, "Duct System," for range hood ducts, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 SEALANT MATERIALS

A. General: All sealants shall have a maximum flame spread of 25 and smoke development rating of 50. Sealants shall be designed for service temperature that the duct is expected to see.

B. Water-Based Duct Joint and Seam Sealant Mastic: Flexible, adhesive sealant, and complying with NFPA requirements for Class 1 ducts. Sealant shall be low odor/low VOC with less that 32 grams/liter VOC per ASTM D-6886 or EPA Method 24. Sealant shall be SMACNA pressure class rated for -0.5" w.g. to +10.0" w.g., and shall meet SMACNA class seal for A, B and C classes. Service temperature limits of sealant shall be -10°F to 190°F. Sealant shall be fiber reinforced, and shall meet UL-181A-M and UL-181B-M for mold growth test. Sealant shall use soap and water for clean up. Sealant shall be RCD #6, Foster 95-90 Vapor Safe, Childers CP-181 Comfort Seal or prior approved equal.

C. Solvent-Based Duct Joint and Seam Sealant: One-part, non-sag, solvent-release-curing, polymerized butyl sealant. Sealant shall contain maximum 420 grams/liter VOC, and comply with ASTM D-2202 and be LEED compliant with SCAQMD Rule 1168 under Sealant category “other” with VOC max of 420 g/l. Sealant shall be SMACNA pressure class rated for +0.5" w.g. to +10.0" w.g., and shall meet SMACNA class seal for A, B and C classes. Service temperature limits of sealant shall be -20°F to 200°F. Sealant shall be Sure Grip 404 by Hard Cast, 32-14 Duct Fas by Foster or prior approved equal.

D. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

E. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

2.3 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

B. Hanger Materials: Galvanized sheet steel or threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electro-galvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.
3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
3. Supports for Aluminum Ducts: Aluminum support materials unless materials are electrolytically separated from ducts.

E. Upper Supports: Provide supplemental angle iron (minimum size: 2" x 2" x 3/16") or Uni-Strut channels between primary building structural members to support rods and straps connected to ductwork. Size supplemental supports and hanger to adequate support load without overloading or excessive deflection.

2.4 RECTANGULAR DUCT FABRICATION

A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Transverse Joints: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details. Contractor has the option of using prefabricated slide-on joints and components for transverse joints, constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement. Prefabricated slide on joints shall be manufactured by Ductmate Industries, Inc., Nexus Inc., or Ward Industries, Inc.

C. Longitudinal Seams: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-5.

D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of nonbraced panel area unless ducts are lined.

2.5 PREFORMED MEDIUM PRESSURE DUCTWORK

A. Single Wall Round Ducts: Round ducts shall be the preformed spiral seam type. Ribbed standing seam duct is not acceptable. Transverse joint shall be the slip type UP TO 22". Provide Accuflange type connection for joining all ducts to ducts, and ducts to fittings on ducts 24" and larger. Provide gasketing and screws as recommended by the manufacturer for Accuflange connection. Connection to flexible round ducts shall be made with stainless steel draw bands. Assembly and installation shall be as recommended in Section III of SMACNA HVAC Duct Construction Standards Manual. Seal all duct joints with the recommended liquid or mastic sealants.

B. Fittings: Medium pressure fittings shall be of all welded construction. Model numbers listed below are Semco Manufacturing, Inc.'s numbers for round single wall ductwork. Substitute equivalent model numbers for double wall round and single/double wall flat oval where applicable. Equivalent fittings from other listed approved manufacturers are acceptable:

1. All 45 degree or 90 degree elbows below 10": E-45-1 or E-90-1
2. All 45 degree or 90 degree elbows above 10": E-45-1 or E-90-5 (5 piece)
3. Branch Take-Offs from Main Ducts: CMT, CMTC, CMT-R, CMTC-R, CL W/E45 or CLC W/E45, CL-R W/E45, CLC-R W/E45
4. Wye Fittings: WYE or WYE-R

C. Standard Bullhead tees, tees, crosses, 90 degree conical fittings and laterals are not acceptable.

D. Manufacturers: Round and flat oval preformed ductwork shall be manufactured by Semco, Monroe Metal, United Sheet Metal Company, Eastern Sheet Metal, Lewis and Lamer, Impulse-Air, Dixie Metal Products and R.V. Money or Graco.

PART 3 - EXECUTION

3.1 DUCT APPLICATIONS

A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:

1. Supply Ducts: 1-inch w.g.
2. Supply Ducts (Downstream of VAV Boxes): 1-inch w.g.

3. Supply Ducts (From AHU’s to VAV Boxes): 4-inch w.g.

B. All ducts shall be galvanized steel.

3.2 DUCT INSTALLATION

A. Drawings show the general layout of ductwork and accessories but do not show all required fittings and offsets that may be necessary to connect ducts to equipment, diffusers, grilles, etc., and to coordinate with other trades. Fabricate ductwork based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades for space available and relative location of HVAC equipment and accessories on ceiling grid. Duct sizes on the drawings are inside dimensions which shall be altered by Contractor to other dimensions with the same air handling characteristics where necessary to avoid interferences and clearance difficulties.

B. Provide pilot tube openings where required for testing of systems, complete with neoprene plug.

C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

D. During construction provide temporary closures of metal or taped 5 mil polyethylene on open ductwork to prevent construction dust from entering ductwork system. Ductwork may not be hung prior to "drying in" of the facility unless all joints are sealed with mastic.

E. Branches from trunk duct and tap-in connection shall be constructed in accordance with Paragraph "Low Pressure Galvanized Steel Ductwork".

F. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.

G. Install round ducts in lengths not less than 12 feet unless interrupted by fittings.

H. Install ducts with fewest possible joints.

I. Install fabricated fittings for changes in directions, size, and shape and for connections.

J. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3 screws in each coupling.

K. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.

L. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

M. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

N. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.

O. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

P. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.

Q. Electrical Equipment Spaces: Contractor shall not route ducts over electrical panels.

R. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches.

S. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."

T. Paint interiors of metal ducts that do not have duct liner, for 24 inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

3.3 APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.

B. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

E. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.

G. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

H. Secure transversely oriented liner edges facing the air stream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

1. Fan discharges.
2. Intervals of lined duct preceding unlined duct.
3. Upstream edges of transverse joints in ducts where air velocities are greater than 2500 fpm (12.7 m/s) or where indicated.

I. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

1. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

J. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

K. Install in accordance with NAIMA Fibrous Glass and Duct Liner Standard AHS-124 and SMACNA HVAC Duct Construction Standards. Liner shall be kept clean and dry. Liner that has become wet shall be replaced. Duct dimensions indicated on the drawings are net inside dimensions required for airflow, and duct size shall be increased to allow for liner thickness.

3.4 SEAM AND JOINT SEALING

A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.

B. Seal all circumferential and longitudinal duct joints in low pressure supply, return, outdoor air and exhaust ducts with sealant as specified herein in accordance with the manufacturer's installation instructions. This includes, but is not limited to Pittsburgh connections, snap locks (all types), etc. Duct tape is not suitable as a substitute. Notify Engineer for on-site review of ductwork joints prior to insulation application. Where gaps exceed manufacturer’s recommendations for sealant only, provide fibrous backing tape.

C. Seal ducts before external insulation is applied.

3.5 HANGING AND SUPPORTING

A. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

B. Use double nuts and lock washers on threaded rod supports. Duct hangers shall be constructed in accordance with Figures No. 4-1,2,4,5,6,7 and 8 as well as tables 4-1,2 and 3. Duct shall not be supported directly from metal decks. Provide upper supplemental framing as required between building structural members.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors according to Division 15 Section "Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline (Figure 2-2, Type RE-3 and Figure 2-5,2-6). Where there is not sufficient space and at the Contractor's option in all other locations, rectangular elbows with turning vanes may be substituted.

D. For turning vane construction see Figure 2-2, Type RE-2 and Figure 2-3 and 2-4. Provide at all square elbows in supply, return and exhaust ductwork and where noted.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees. Provide Type 2 or Type 3 offsets where required. See Figure 2-9.

F. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area. See Figure 2-10 for easement construction.

G. All branch take-offs of rectangular ducts shall be made with "45 degree entry" fitting in accordance with Figure 2-8 or by means of "parallel flow branches" with turning vanes and locking splitter dampers (Figure 2-7) where indicated. All branch take-offs of round ducts shall be made with "Bellmouth take-off collar," or “45° take-off collars" as specified in Section 15820.

END OF SECTION 15815

SECTION 15820 - DUCT ACCESSORIES

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. Flexible connectors.
2. Duct accessory hardware.
3. Medium pressure flexible ducts.

1.3 SUBMITTALS

A. Product Data: Submit under provisions of Section 15050 for the following:

1. Low pressure flexible ducts.
2. Medium pressure flexible ducts.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Install in accordance with 2005 International Mechanical Code.

PART 2 - PRODUCTS

2.1 FLEXIBLE CONNECTORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated. Flexible connections must be in compliance with appendix "D" NFPA 90A requirements.

B. Manufacturers:

1. Ductmate Industries, Inc.
2. Duro Dyne Corp.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.

C. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Select metal compatible with ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz. /sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

2.2 FLEXIBLE LOW PRESSURE ROUND DUCTWORK

A. General: Insulated low pressure flexible duct shall be a factory fabricated assembly consisting of a non-perforated polyester film inner liner, zinc-coated spring steel helix, wrapped with fiberglass insulation and a bi-directional reinforced metalized polyester film outer vapor barrier wrap. The insulation shall have a minimum R of 4.2 except that a R value of 8.0 shall be provided for all flex ducts located above insulation boundary in attics. R value of 8.0 shall also be provided for any flex ducts specifically identified on the drawings with R-8 insulation requirements. Insulation shall have a maximum conductance (C) of 0.238 at 75°F. The insulations thermal performance shall be measured in accordance with the ADC Flexible Duct Performance and Installation Standards (1991) using ASTM C518. The composite assembly, including insulation and vapor barrier, shall meet the Class 1 requirements of NFPA 90-A and be labeled by Underwriters' Laboratories, Inc., with a flame spread rating of 25 or less and a smoke developed rating of 50 or less. Low pressure flexible ductwork shall be manufactured by Certain Teed, Thermaflex, Genflex, Metraflex, Atco or Flexmaster. Flexible duct with R value of 8.0 shall be model G-KM-R-8 as manufactured by Certain Teed, or equal by Thermaflex, Genflex, Metraflex, Atco or Flexmaster.

2.3 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.4 FLEXIBLE MEDIUM PRESSURE ROUND DUCTWORK

A. General: Insulated medium pressure flexible duct shall be a factory fabricated assembly consisting of an acoustically rated chlorinated polyethylene (CPE), corrosion resistant inner core fiberglass insulation, sheathed in a bi-directional reinforced metalized polyester film outer vapor barrier jacket. The composite assembly, including vapor barrier and insulation, shall meet the Class 1 requirements of NFPA 90A and be labeled by Underwriter's Laboratories, Inc., with a flame spread rating of 25 maximum and a smoke developed rating of 50 maximum. The insulation shall have a minimum R of 4.2 and maximum conductance (C) of 0.238 at 75°F. Maximum operating pressure shall be 10-inch water column positive for 4 to 12 inch diameter, and 6 inch water column for 14 to 16 inch diameter, and maximum 5,000 feet per minute velocity. All medium pressure flexible duct connections shall be made by thoroughly coating the interior of the duct to a depth of 3" with an approved high pressure duct sealer and secured in place over a sheet metal collar with ½" wide positive locking stainless steel straps and draw band.

B. Manufacturers: Metalflex, Atco, Thermaflex or Flexmaster.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in accordance with manufacturer’s instructions.

B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, use stainless-steel accessories in stainless-steel ducts, and use aluminum accessories in aluminum ducts.

C. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.

D. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment unless specifically noted otherwise. Flexible connectors are not required on equipment that has internal flexible connectors.

E. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

F. Install duct test holes where indicated and required for testing and balancing purposes.

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

3.3 CONNECTION OF FLEX DUCTS

A. Secure all flexible ducts with 1/2" wide stainless steel draw bands with worm gear assembly and hardened tightening screw. After metal band is installed on the inner duct, the exterior vapor barrier shall then be secured with nylon "zip-strip" bands. Flexible duct support width shall be minimum 4" wide and shall extend at least ½ of the circumference of the flexible duct. Flexible ducts shall be installed in a fully extended condition free of sags and kinks, using only the minimum length required to make the connection. Ends of flex duct shall be secured with metal draw bands (nylon "zip-strips" are not acceptable). Installation, including attachment and support, shall be in accordance with the manufacturer's written instructions and with the latest edition of SMACNA Flexible Duct Installation Standards. Flexible duct runs shall be a maximum of 8', unless a longer length is specifically shown on the drawings.

END OF SECTION 15820

SECTION 15840 - VAV BOXES AND FAN POWERED 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. VAV Terminal Units

B. Integral Variable Volume Dampers

C. Integral Hot Water Heating Coils

1.3 REFERENCES

A. Current enforced editions of the following shall be used:

1. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
2. UL 181 - Factory-Made Air Ducts and Connectors.
3. ARI 885 - Standard for Estimating Occupied Space Sound Levels in the Applications of Air Terminals and Air Outlets.
4. ETL - Agency listing for unit construction and operation.
5. ARI-880 – Standard for Variable Volume Air Terminals.

1.4 SUBMITTALS

A. Submit shop drawings and product data sheets indicating configuration, general assembly, and materials used in fabrication under the provisions of Section 15010.

B. Submit catalog performance ratings which indicate air flow and static pressure.

C. Submit radiated sound power levels (2nd through 7th octave bands) at design maximum operating conditions. Also submit Radiated Sound and Discharge Sound NC values. NC levels for radiated and discharge NC levels shall be based on attenuation values as outlined in ARI Standard 885-98, Appendix E. Radiated sound attenuation values shall be based on Type 2, Mineral Fiber Tile at 5/8" thick.

D. Submit configuration (left or right hand) for each unit based on configuration shown on drawings.

E. Submit data on flow sensor gain constant and proof of minimum 0.03” signal at 450 fpm.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 15020.

1.6 EXTRA MATERIALS

A. See Section 15051 for the supply and transfer of extra materials to the Owner.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not operate boxes for any purpose, temporary or permanent, until ductwork is clean, AHU filters are in place, AHU bearings lubricated, and all equipment has been test run under observation and is operating properly.

1.8 WARRANTY

A. See Section 15020 for warranty information.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. General: Manufacturers must participate in the ARI Certification program. Unit performance data must be rated and certified in accordance with ARI Standard 880, and must display the ARI seal on all standard units. All sound data shall be based on tests conducted in accordance with ARI-880. Sound performance shall be ARI certified.

B. Specified Manufacturers: Trane, Nailor Industries, Tuttle and Bailey, York, Metal-Aire, Enviro-Tec, Titus/Magnaflow, E. H. Price or Krueger.

2.2 MANUFACTURED UNITS

A. Concealed variable air volume supply air control terminals for connection to single medium pressure duct central air systems, with variable volume, pressure independent control, and unit mounted hot water heating coil.

B. Identify each airflow unit with clearly marked, engraved identification label and airflow indicator. Label shall include unit nominal air flow, maximum scheduled air flow, minimum scheduled air flow, hot water coil GPM.

2.3 FABRICATION

A. Casings: Units shall be completely factory assembled, manufactured of zinc coated corrosion protected steel, and fabricated with a minimum of 22-gauge metal. Housing shall be sealed and gasketed with leak resistant construction.

B. Insulation: Entire interior of VAV box shall be internally insulated with minimum 1" thick dual density fiberglass insulation, with high density skin (exposed to air stream) and low density core. Insulation shall comply with UL 181 for air erosion, UL 181 for mold growth and humidity, UL 723 for flame and smoke of 2550, ASTM E84 for Flame and Smoke of 2550, and ASTM C665 for fungi resistance. Installed thickness shall provide minimum thermal conductance of insulation of 0.26." BTU / h / ft ^{2}˚F at 75˚F, or R = 3.9.

C. Plenum Air Outlets: Slip and drive duct connections on unit discharge connection.

D. Inlet Connection: 2” long for allowing duct connection.

2.4 VOLUME DAMPER

A. Locate air volume damper inside unit casing. Construct from extruded minimum 18 gauge aluminum or 20 gauge (0.9 mm) galvanized steel components. Key damper blades into shaft with nylon fitted pivot points. Damper shaft shall be mounted in self lubricating bearings.

2.5 VARIABLE FLOW SENSOR

A. Units shall not require periodic maintenance. All units shall permit external mechanical adjustment to reset the maximum and minimum volume of air. Calibration dials shall indicate the delivery of air without any other flow measurements. The primary air throttling terminal devices shall maintain constant volume at all flow rates dictated by the room thermostat, regardless of changes in duct pressures upstream and/or downstream of the device. Multi-point flow sensor shall be ring or cross with minimum four (4) sampling points, with gauge ports for field measuring. Flow sensor shall send an amplified differential pressure signal of at least 0.03” wg at an air velocity of 450 feet per minute. The device shall be pressure independent at all flow rates within its published capacity range. VAV box damper's nominal rating may not be exceeded.

B. Means for air balancing and pressure shall be a factory furnished and mounted multi-point (minimum 4 point), multi-axis flow ring or cross, and differential pressure transducer. Flow-thru or hot wire devices are not acceptable. Unit shall be capable of maintaining air flow to within 5 percent of rated unit airflow set point with 1.5 duct diameters straight duct upstream from the unit.

2.6 ACTUATOR AND DDC CONTROLLER

A. Electric actuator and DDC controller shall be furnished by controls contractor to VAV box manufacturer. Box manufacturer shall factory mount actuator and controller. Controller shall be matched with the sensor gain of the flow sensor to allow proper control at minimum cfm (minimum differential pressure signal) and at maximum cfm (so transducer is not overloaded). Transducer controller maximum pressure limits shall not be exceeded with the velocity pressure at maximum cfm and sensor gain of submitted flow sensor.

2.7 HOT WATER HEATING COILS

A. Coils shall be standard accessory furnished by the box manufacturer. Coil shall be minimum 1/2" O.D. seamless copper with 0.016" wall thickness and leak tested at 300 psig. Fins shall be aluminum. Coil design and application shall be self-draining, having no pockets in any circuit. Where manufacturer offers an option for factory installed manual air vent, manual air vent sahll be supplied. Supply and return tube connection shall be at the same end, and shall be on the same side of the VAV box as that shown on the drawings. Coils shall be tested and certified to ARI Standard 410. Coils shall be factory furnished and factory mounted on box for VAV boxes. Discharge at coils on VAV boxes shall have slip and drive construction for connection to metal ductwork. Coil shall be contained in a 0.030" (22 gauge) galvanized steel casing.

2.8 WIRING

A. Mount electrical components in control box with removable cover. Box manufacturer shall factory mount a DDC controller provided by successful DDC controls manufacturer to each VAV box. Mount actuator, controller and controls on side as shown on plans. The DDC controller for each VAV box shall be factory wired to the actuator and transformer prior to shipment to the job site. Incorporate single point electrical connection to power source to supply all components.

B. VAV box manufacturer shall provide and shall factory mount transformer for control voltage. Controls contractor shall furnish VAV box manufacturer with VA load of actuator, hot water valve, and DDC controller. Provide terminal strip in control box for field wiring of all required sensors and for connection to field installed hot water valve. Hot water valve is provided by controls contractor. Provide appropriate primary and secondary voltage as required, and fusing as required by NEC. See electrical drawings for primary voltage.

2.9 MAXIMUM LEAKAGE

A. Maximum Casing Leakage: Three (3) cfm at one (1) inch WG inlet static pressure.

B. Maximum Damper Leakage: Two (2) percent of design air flow at three (3) inch WG inlet static pressure in fully closed position.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Suspend VAV units from 1" wide 20 gauge galvanized straps attached to 1-1/2" x 1-1/2" x 1/4" angle iron framing attached (welded) to building structural members in area with steel roof framing and directly to concrete deck in areas with concrete roof deck. See also Section 15060.

C. Units shall be fully insulated at the factory to insure that the unit will not sweat at 50°F entering air. Any unit that has condensation forming on its exterior shall, at the Owner's option, be (1) removed and returned to the factory for re-insulating or (2) field wrapped with 2" thick fiberglass insulation (complying with the requirements of section 15080 for supply duct) or (3) replaced with a new unit to eliminate the problem. These corrective actions (if necessary) shall be made at no additional cost to the Contract.

D. Provide minimum of three (3) inlet diameters of straight duct upstream of VAV box connection. Provide maximum of 12” of medium pressure flex duct at inlet. Flex duct shall be straight. Inlet duct shall be the same size or greater than the VAV box connection size.

E. Control enclosure for actuator and controller shall be installed a minimum of 24” from any obstruction to allow service clearance to the actuator and controller.

END OF SECTION 15840

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, conventional thermostats, relays, switches, contactors, personal computers and accessories, control valves, transformers, differential pressure switches, etc.

C. This project includes maintaining the operation and control functions of many existing to remain pieces of HVAC equipment, including but not limited to, air handling units, pumps, and boilers.

D. Existing Control System Operation: The Owner has an existing pneumatic control system that controls the current VAV boxes and control dampers. This pneumatic control system is being completely replaced by a new DDC control system. The controls contractor under this contract shall be required to familiarize themselves with the existing control system, including sequences of control, sensor locations, controller locations, panel functions and locations, and all other aspects of the existing control system.

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. DDC control riser diagram showing all DDC controllers, operator work stations and network wiring.

2. Single line schematics and flow diagrams showing the location of all control devices.
3. Points list for each DDC controller with input/output schedule.
4. Vender's own written description for each sequence of operation.
5. Detailed bill of material for each panel.
6. Control damper schedule.
7. Control valve schedule
8. Catalog cut sheets for all equipment used, including but not limited to: sensors, thermostats, actuators, etc.
9. Operator work station data and DDC panel data.
10. 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.

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 Gordon College has an existing Johnson Metasys control system, the Contractor shall provide Johnson Metasys controls (no equal) as the sole manufacturer and installer of the control system for all work specified herein in Section 15900. These controls shall be factory installed before they are shipped to the job site. All control components shall be Native BacNet Compatible.

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. Wireless Temperature Sensor: Provide with warmer/cooler (+/-) setpoint adjustment and manual occupancy override button.

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. Variable Air Volume (VAV) Control Valves: control valves shall be full port, two-way, modulating-position ball valves with electric/electronic actuators. Valve shall have minimum 125 psi static pressure rating. Ball valve size shall match the size of the valve components shown on the “Hot Water VAV Box Piping Detail.” Valve shall have forged brass body with chrome-plated brass ball with EPDM double O-ring stem seal, and blowout proof stem. Provide EPDM ball O-rings. Actuator shall be factory or field mounted, 24 VAC, direct connected to stem with single screw coupler and without the use of linkages. Torque requirements of actuator shall be selected to overcome the breakaway torque of the valve, and to open and close against the differential pressure at the loop pumps. “Erie” type valves and solenoid valves shall

not be allowed. Provide magnetic clutch for torque protection of the actuator and valve. Valve shall be capable of being manually opened to allow water flow if control circuit malfunctions, and to allow TAB work. Valves shall be manufactured by Siemens, Delta, Belimo, Johnson Controls or Warren.

I. Differential Pressure Switch:

1. Provide electric controllers for binary (two-position) operation as specified in sequence of operation. Sensors integrity and accuracy shall not be affected by shock, vibration, and pressure surges of 150 percent of working pressure range or 25 psig above or below scale.

a. Electric Differential Pressure Switch: Provide Bourbon tube, bellows, or diaphragm type, with tamper proof adjustable set point and differential settings. Provide three valve manifolds for servicing. Provide filter bank switch with time delay to prevent false alarms due to pulsations. Provide switch rating as follows:

1) Switch Pressure Range: Between 150 percent and 300 percent of the working differential pressure.
2) Adjustable Switch-differential Range: As indicated.

J. Actuators: Damper and valve type actuators shall be DDC type, capable of controlling dampers and valves in response to a varying air pressure or electric signal from a control device. Actuators shall be capable of being used for either modulating or two position action. Actuators shall be large enough to operate dampers and valves positively, efficiently and smoothly. Actuators which will lock in an intermediate position if the motor shaft is pushed or pulled (either manually or by air pressure acting or damper blades) shall not be acceptable. Actuators for fire/smoke dampers labeled “SD/FD” or smoke dampers labeled “SD” shall be electric (120 VAC powered open/spring closed) and provided integral with the damper.

K. Controllers: All Controllers shall be proportional single or dual input with integral or remote set point adjustment, adjustable sensitivity and reset range. Controllers shall be relay type with pneumatic feedback. Provide for each input temperature calibrated gauges corresponding to input transmitter range and output pressure gauges, where specified. Where gauges are not specified, provide fittings for temperature service gauge connection.

L. Automatic Control Dampers (Automatic Volume Dampers): Dampers shall be low leakage type. Automatic control dampers shall be of the modular type constructed of modular sections. Maximum size of any one section shall be 60" x 72". Frame shall be constructed of 16 ga. galvanized steel hat channel with tabbed corners. Blades shall be 14 gauge galvanized steel, roll formed, airfoil type. Blade edge seals shall be vinyl suitable for -76°F to 350°F range, mechanically locked into the blade edge. Adhesive or clip type seals are not allowed. Jamb seals shall be flexible metal compression type to prevent leakage between blade edge and damper frame. Blade end overlapping frame is not allowed. Shafts shall be 1/2" diameter, hex or square, cold-drawn machined steel, with drive shaft extendable to 5". Bearings shall be corrosion resistant, permanently lubricated, stainless steel sleeve type. Linkage shall be concealed out of air steam within the damper frame. Dampers under 12 inches in height shall be single blade type. Parallel blade dampers shall have linear characteristics and opposed blade dampers shall have equal percentage characteristics. Two-position dampers shall be parallel and modulating dampers shall be opposed. Provide submittal data showing leakage, maximum airflow, and maximum pressure ratings based on AMCA 500. Maximum system pressure of

48" wide damper shall be 6.2 W.G. Maximum velocity of 48" wide damper shall be 4000 fpm. Units shall carry the AMCA seal for air leakage. At a pressure differential of 1" W.G., leakage through the closed damper shall not exceed 3 cfm per square foot for 48" wide dampers. Pressure drop through the open damper at an approach velocity of 1000 FPM shall not exceed 0.05" W.G. Close-off operating torque at a static differential of 4" W.G. shall not exceed 3.1 lb. in per sq. ft. of damper. Control damper shall be Ruskin Model CD-60, Greenheck Model VCD-33 or equal by Johnson.

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. Space Temperature Sensors: Low profile zone temperature sensor with thumb wheel adjustment for +/-3°F off setpoint and push button override. Setpoint temperature and override time duration shall be adjustable from software at the main DDC panel or workstation. Mount on wall at 4' 6" above finished floor, unless noted otherwise. All corridor space temperature sensors shall be mounted at 7' 0" above finished floor..

E. 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. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 54 inches above the floor, unless noted otherwise.

D. Install automatic dampers according to Division 15 Section "Duct Accessories."

E. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

F. Install labels and nameplates to identify control components according to Division 15 Section "Mechanical Identification."

G. Install hydronic instrument wells, valves, and other accessories according to Division 15 Section "Hydronic Piping."

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. 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.
5. 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. Refer to Division 1 Section "Demonstration and Training."

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. Controllers for rooftop equipment shall not be above high ceilings (12 feet or higher ceiling), and shall not be mounted at the equipment or above the roof line. Some specific controller locations may be indicated on the drawings. Controllers for rooftop equipment **[in Sectors]** shall be installed in the mechanical corridors to allow easy access, and shall not be installed elsewhere. If a location is not specifically shown for a piece of rooftop equipment, or if the location is not identified in this paragraph, controller may be installed above ceilings lower than 12 feet. Controllers for vertical water source heat pumps shall be mounted on wall adjacent to unit.

3.11 VAV BOX DDC CONTROLLERS AND ACTUATORS

A. The controls contractor shall ship their DDC controllers and actuators for each VAV box to the VAV box manufacturer, and shall coordinate with the VAV box manufacturer so that these controllers and actuators are factory installed and factory wired prior to shipment to the job site. Controls contractor shall provide VA data for actuator, controller and hot water valve to allow the VAV box manufacturer to properly size control transformer for these devices. Transformer for VAV box is provided by VAV box manufacturer.

3.12 LINE VOLTAGE CONTACTOR LOCATIONS

A. Controls contractor shall mount line voltage contactors serving exhaust fans (and other devices) in mechanical corridors, mechanical closets, electrical rooms, janitor's closets, and similar locations as indicated on the drawings. If no specific contactor location is indicated on the drawings, contractor may mount contactor above ceilings, provided that the ceiling is 12 feet or lower and provided that contactor is accessible and near the piece of equipment served.

3.13 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.) Anytime night setback program is activated, all exhaust fans shall remain off.
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. Fire Safety Controls: All supply air systems above 2000 cfm shall be provided with a supply duct mounted smoke detector furnished under Division 16. Certain pieces of equipment may be identified on the drawings as being provided with factory installed smoke detectors. Certain pieces of equipment as indicated in later paragraphs shall also be subject to an emergency shutdown function which shall be activated by closure of the HVAC shutdown relay by a signal from the main fire alarm panel.

6. Emergency Shutdown Controls: All WSHP, RTAC, and DD units shall be subject to an emergency shutdown function which shall be activated by closure of the HVAC shutdown relay in the main fire alarm panel. This equipment shall also be shutdown upon a phase loss condition. This is a separate emergency shutdown function than the loop water panel emergency shut down, which shall shut down only WSHP equipment during a loop water problem.

B. Sequence of Operation for VAV Boxes with Hot Water Coils (Typical): When space temperature rises above cooling setpoint as sensed by wall mounted space sensor, the VAV box's damper shall modulate to its maximum cfm position. As the space temperature drops below the cooling setpoint, the VAV box's damper shall modulate to its minimum cfm position. As the space temperature continues to fall to the heating setpoint, the modulating hot water valve shall modulate from the fully closed (to the coil) position to the fully open to maintain setpoint. Space temperature sensors shall also serve as night setback room temperature sensor.

C. Sequence of Operation for VAV Boxes with Hot Water Coils (VV-101, VV-203, &VV -217): VAV boxes VV-101, VV-203, & VV-217 shall provide auxiliary cooling to the zones with existing ductless fan coil units DFCU-1, DFCU-2, & DFCU-3. When space temperature rises above cooling setpoint of 78 deg. F (adjustable) as sensed by wall mounted space sensor, the VAV box's damper shall modulate to its maximum cfm position. As the space temperature drops below the cooling setpoint of 78°F the VAV box's damper shall modulate to its minimum cfm position. As the space temperature continues to fall to the heating setpoint, the modulating hot water valve shall modulate from the fully closed (to the coil) position to the fully open to maintain setpoint. Space temperature sensors shall also serve as night setback room temperature sensor.

D. Sequence of Operation for existing Ductless Fan Coil Units (DFCU-1,DFCU -2, & DFCU-3): DFCU shall operate as the zone's primary cooling under the dictates of its own wall mounted low voltage space thermostat to cycle the compressor and reversing valve to maintain space temperature setpoint.

E. Sequence of Operation for Smoke Damper and Fire/Smoke Dampers: Smoke dampers and fire/smoke dampers shall be provided with a relay (relay provided by electrical), which shall be closed upon activation of the building fire alarm panel. The closing of this relay shall interrupt power to the damper, and it shall automatically close. The damper shall open following restoration of power to the relay. Fire/smoke damper shall additionally be provided with a temperature element which shall close in the event high heat is detected, independent of the fire alarm panel.

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. Air Systems:
2. Hydronic Piping Systems.
3. Existing systems TAB.
4. Verifying that automatic control devices are functioning properly.
5. 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 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outside-air dampers at minimum, and return- and exhaust-air dampers at a position that simulates full-cooling load.

2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.
7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
8. Record the final fan performance data.

3.5 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.

3.6 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. Verify gpm at calibrated venturi balancing valves at VAV boxes.

C. Verify pressure differential is within 2 to 32 psi range as specified for automatic flow control valves at VAV boxes and at other equipment served by automatic flow control valves**.**

D. Adjust calibrated venturi balancing valves where automatic flow control valve pressure differential is above 32 psi, and re-verify gpm and pressure differential to within specified tolerances of indicated flow rate.

E. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

F. Measure the differential-pressure drop across the control valve and coil at the conclusions of balancing to provide input data for control contractor to set VFDs differential pressure setpoint..

3.7 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

3.8 PROCEDURES FOR PRIMARY-SECONDARY-FLOW HYDRONIC SYSTEMS

A. Balance the primary system crossover flow first, then balance the secondary system.

3.9 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform TAB of existing systems to the extent indicated by the contract documents. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of each fan.

2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the refrigerant charge.
4. Check the condition of filters.
5. Check the condition of coils.
6. Check the operation of the drain pan and condensate drain trap.
7. Check bearings and other lubricated parts for proper lubrication.
8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Deficiencies noted in the preconstruction report shall be brought to the attention of the Owner. After the Owner has corrected deficiencies, TAB of existing systems may be performed.

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows and determine the new fan, speed, filter, and coil face velocity.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the airflow and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated airflow and water flow rates. If 5 percent or less, equipment adjustments are not required.
4. Air balance each air outlet.

3.10 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.

3.11 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.

3.12 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 10 percent to minus 10 percent.
2. Air Outlets and Inlets: Plus 10 percent to minus 10 percent.
3. Heating-Water Flow Rate: Plus 10 percent to minus 10 percent.
4. Cooling-Water Flow Rate: Plus 10 percent to minus 5 percent.

3.13 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.

3.14 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. Engineer's name and address.
6. Contractor's name and address.
7. Report date.
8. Signature of TAB firm who certifies the report.
9. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
10. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.

11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer, type size, and fittings.
13. Notes to explain why certain final data in the body of reports varies from indicated values.
14. Test conditions for fans and pump performance forms including the following:

    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Fan drive settings including settings and percentage of maximum pitch diameter.
    e. Settings for supply-air, static-pressure controller.
    f. Other system operating conditions that affect performance.

D. Final Report Contents: In addition to certified field report data, include the following:

1. Fan 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. Quantities of outside, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Position of balancing devices.

F. Air Distribution Test Sheet

1. Air outlet (grille or register) identification (tag)
2. Room number/location with identification numbers and diagrams
3. Terminal type
4. Terminal size
5. Design air flow
6. Test (final) air flow, CFM
7. Percent of design air flow

8. Low pressure duct test (see later paragraph)

G. Low Pressure Duct Leak Test (Repeated Until Leakage ≤5%) (Perform Prior To Insulating)

1. Description of ductwork under test
2. Duct design operating pressure
3. Duct design test static pressure
4. Duct capacity, air flow
5. Maximum allowable leakage rate (at duct capacity times leak factor of 5%)
6. Leakage rate (airflow, by duct traverse at equipment minus sum of air outlet totals)

H. VAV Box Data

1. Manufacturer/model Number
2. Identification (tag) Location
3. Minimum and maximum primary airflow, design and actual
4. Actual inlet static pressure (at inlet to primary air valve)
5. Actual discharge static pressure (at outlet duct connection or discharge side)
6. Hot water gpm, hot water coil p.d. and air p.d.
7. Electric heat data as previously specified
8. Static pressure of low pressure duct at minimum airflow (on electric heat boxes only).

3.15 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 and Engineer.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Owner and Engineer.
3. Owner and Engineer 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.

3.16 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.

3.17 REPORT

A. Provide four copies of the Test and Balance report to the 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 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 1 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:

    a. Identify Project, Contractor and Subcontractor as appropriate.
    b. Apply Contractor's stamp, signed or initialled 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.
    c. Schedule submittals to expedite the Project, and deliver to Architect at business address. Coordinate submission of related items.

2. 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.
3. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
4. Revise and resubmit submittals as required, identify all changes made since previous submittal.
5. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.4 SHOP DRAWINGS

A. Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Architect/Engineer.

1.5 ACCEPTABLE PRODUCTS

A. 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.

1.6 PRODUCT DATA

A. Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Architect/Engineer.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

C. 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

D. 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-meal" will be returned without review.

E. Mark dimensions and values in units to match those specified.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable Building Code for City of Barnesville, Lamar County, Georgia.

B. Electrical: Conform to NFPA 70.

C. Obtain permits, and request inspections from authority having jurisdiction.

1.8 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.

1.9 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 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. 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/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

C. ANSI/NFPA 70 - National Electrical Code.

D. 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, non-metal conduit, fittings and, conduit bodies.

1.8 PROJECT RECORD DOCUMENTS

A. Accurately record actual routing of conduits underground.

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.

B. Wet and Damp Locations: Use rigid steel conduit or intermediate metal conduit.

C. Dry Locations: Use rigid steel conduit, intermediate metal conduit or electrical metallic tubing (EMT).

D. Metal Conduit:

1. Rigid Steel Conduit: ANSI C80.1.
2. Intermediate Metal Conduit (IMC): Rigid steel.
3. Electrical Metallic Tubing (EMT)

4. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.
   a. Fittings for EMT: Insulated throat steel compression type. Set-screw type unacceptable.

E. Flexible Metal Conduit:

1. Description: Interlocked steel construction.
2. Fittings: ANSI/NEMA FB 1.

F. Liquidtight Flexible Metal Conduit:

1. Description: Interlocked steel construction with PVC jacket.
2. Fittings: ANSI/NEMA FB 1.

2.2 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers of conduit products specified herein are as follows: Allied, Certainteed, Anaconda, Triangle, Wheatland, LTV, Cantex or Carlon.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation."

B. Install nonmetallic conduit in accordance with manufacturer's instruction and as specified herein.

C. All conduit shall be routed concealed where possible.

D. Arrange supports to prevent misalignment during wiring installation.

E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

F. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

G. Fasten conduit supports to building structure and surfaces under provisions of Section 16190.

H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports

I. Do not attach conduit to ceiling support wires.

J. Arrange conduit to maintain headroom and present neat appearance.

K. Route exposed conduit parallel and perpendicular to walls.

L. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

M. Maintain adequate clearance between conduit and piping.

N. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

O. Cut conduit square using saw or pipecutter; de-burr cut ends.

P. Bring conduit to shoulder of fittings; fasten securely.

Q. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

R. Install no more than equivalent of four 90-degree bends between boxes. Use hydraulic one-shot bender to fabricate or factory elbows for bends in metal conduit larger than 2 inch size.

S. Provide sealing fittings on all conduit runs which penetrate exterior walls and refrigerated spaces to prevent circulation of air and/or condensation.

T. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

U. Provide insulating bushings on all RGS and IMC conduits entering wireways, pullboxes, cabinets, panelboards, etc.

V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control and expansion joints.

W. Use "Push-Pennies" to protect installed conduit against entrance of dirt and moisture.

X. Ground and bond conduit under provisions of Section 16170.

Y. Flexible conduit shall not exceed 3'-0" in length unless specified otherwise.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements.

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

A. BUILDING WIRE AND CABLE

B. Description: Single conductor insulated wire.

C. Conductor: Copper no exceptions. Solid conductor for 10 AWG and smaller, stranded for 8 AWG and larger.

D. Insulation Voltage Rating:600 volts.

E. Insulation: ANSI/NFPA 70; Type XHHW insulation for circuits 6AWG and larger; Type THHN/THWN insulation for circuits 8 AWG and smaller. At the contractor's option, type THHN/THWN insulation may be utilized throughout for all feeders and branch circuits.

F. Acceptable Manufacturers: Allied, American Insulated, Carol, Pirelli, Rome, Senator, Southwire or Triangle. Only product of domestic manufacture will be accepted.

2.2 WIRING CONNECTORS

A. Solderless Pressure Connectors: 3M Skotch-loks, T & B Freespring, or Ideal Wing Nut for 10 AWG and smaller

B. Compression Connectors: Burndy Hydent, Ilsco 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. Equal product as manufactured by Burndy or Ilsco are acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather and that raceway systems are complete.

B. Verify that mechanical work likely to damage wire has been completed.

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 nylon cable ties by Thomas and Betts, Panduit or Ideal.

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 stranded 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. 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. Verify locations of floor boxes and outlets prior to rough-in.

C. 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 boxes to preserve fire resistance rating of partitions and other elements.

E. Use adjustable steel channel fasteners for hung ceiling outlet box.

F. Do not fasten boxes to ceiling support wires.

G. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.

H. Use gang box where more than one line voltage device is mounted together. Do not use sectional box.

I. Use separate boxes for low voltage systems. Do not install line voltage and low voltage devices within same outlet.

J. Use cast outlet box in exterior locations exposed to the weather and wet locations.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Coordinate with Division 15 contractor for exact location of equipment.

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. Provide a separate grounding conductor in all conduits, no exceptions. Connect outlet boxes to grounding conductors with screw fastened bonding jumper.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Conductors: Soft drawn copper conductor as specified in Section 16123.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Supplementary Grounding Electrode: Use driven ground rods on exterior of building.

3.2 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.

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. 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.

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.

G. Install free standing equipment atop concrete housekeeping pads, minimum 4 inches.

H. Provide concrete housekeeping curbs, minimum 4 inches, to surround exposed conduit below surface mounted equipment and backboards.

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. Conduit color coding.

D. Equipment backboards color coding.

E. Panelboard directories.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 16010.

B. Include schedule for nameplates.

PART 2 - PRODUCTS

A. MATERIALS

B. Nameplates: Engraved two-layer laminated plastic, black letters on a white background.

C. Tape: Vinyl plastic electrical tape.

D. 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 shall be as follows:

1. 120/208V System:

a. Phase A: Black
b. Phase B: Red
c. Phase C: Blue
d. Phase N: White
e. Phase G: Green

3.3 NAMEPLATE ENGRAVING SCHEDULE

A. Provide nameplates to identify all electrical distribution and control equipment, and loads served.

B. Provide nameplates of minimum letter height as scheduled below.

1. Enclosed switches/circuit breakers, switchboard distribution breakers, and motor starters: 1/8 inch; identify load served.

3.4 PANELBOARD DIRECTORIES

A. For all panelboards affected, provide neatly typewritten modifications to directory showing each device added.

B. Locate directory inside panelboard door. Protect directory with clear plastic.

END OF SECTION 16195