



PROJECT NO: 2KM #22-21.01a
RCBOE# B-22-009-2574

PROJECT MANUAL
FOR
RICHMOND COUNTY BOARD OF EDUCATION
WESTSIDE HIGH SCHOOL TEMPORARY
CLASSROOMS
RCBOE# B-22-009-2574

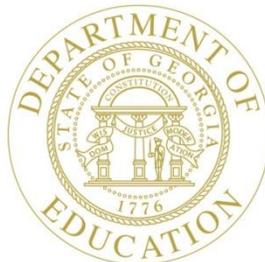
1002 Patriots Way
Augusta, GA 30907

APRIL 5, 2024

BID SET DOCUMENTS

PREPARED BY:

2KM ARCHITECTS, INC.
529 Greene Street
Augusta, Georgia 30901
(706) 736-3333



RICHMOND COUNTY BOARD OF EDUCATION
864 Broad Street
Augusta, Georgia 30901

**WESTSIDE HIGH SCHOOL TEMPORARY CLASSROOMS
FOR
RICHMOND COUNTY BOARD OF EDUCATION
AUGUSTA, GEORGIA
RCBOE# B-22-009-2574**

CONSULTANTS

**PFA ENGINEERING, INC.
1201 Broad Street, Suite 3A
Augusta, GA 30901
(706) 722-3959**



**ELECTRICAL DESIGN CONSULTANTS, INC.
1201 Broad Street, Suite 1A
Augusta, GA 30901
(706) 724-3551**



WESTSIDE HIGH SCHOOL TEMPORARY CLASSROOMS
RCBOE #B-22-009-2574
2KM #2022-21.01a
1002 Patriots Way
Augusta, GA 30907

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COUNTY BOARD OF EDUCATION OF RICHMOND COUNTY
INVITATION TO BID

Sealed proposals from Contractors will be received for the **B-22-009-2574 – Westside High School Temporary Classrooms** by the County Board of Education of Richmond County at the address below until **3:00 PM** local time, **May 9, 2024**. This will be a public bid opening, read aloud in the Richmond County Board of Education Conference Room located at 864 Broad Street, Augusta, Ga. 30901. No extension of the bidding period will be made.

A Pre-Bid Conference will be held **April 24, 2024 at 10:00AM** local time in the Media Center Conference Room, Westside High School, 1002 Patriots Way, Augusta, GA 30907.

Drawings and project manual on this work may be examined at the Department of Maintenance and Facilities, Richmond County Board of Education, 2956 Mike Padgett Highway, Augusta, GA 30906.

Bidding documents may be obtained at the **Office of the Architect: 2KM Architects, Inc., 529 Greene Street, Augusta, Georgia 30901**. Applications for documents together with refundable deposit of **\$250.00** set should be filed promptly with the Architect. 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 prime contractor who submits a bona fide bid upon return of such set in good condition within 10 days after date of opening bids. All other deposits will be refunded with deductions approximating cost of reproduction of documents upon return of same in good condition within 10 days after date of opening bid.

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.

Bid must be accompanied by a bid bond in an amount not less than 5% of the base bid. Personal checks, certified checks, letters of credit, etc., are not acceptable. The successful bidder will be required to furnish performance and payment bonds in an amount equal to 100% of the contract price.

The Owner reserves the right to reject any and all bids and to waive technicalities and informalities.

BID LIST: The Richmond County Board of Education maintains a bid list for many categories that are let for bid each year. If your company wishes to remain on our bid list, we must receive a response either through a bid or by a no bid response. If we do not receive a response, your company's name will be removed from our bid list. Please call the bid office at 706-826-1298 if you fail to receive a post card.

To promote local participation, a database of Sub-contractors, Suppliers, and Vendors has been developed by the Program Manager, GMK Associates. Contact Jeanine Usry with GMK Associates at (706) 826-1127 for location to review and obtain this database.

Bids shall be submitted and addressed to:

Dr. Kenneth Bradshaw
County Board of Education of Richmond County
Administrative Office
864 Broad Street
Augusta, Georgia 30901
c/o: Mr. Bobby Smith, CPA

SECTION B - PROPOSAL FORM

INSERT NAME AND ADDRESS

DATE _____

RE: B-22-009-2574
Westside High School Temporary Classrooms
1002 Patriots Way, Augusta, GA 30907

Ladies and Gentlemen:

B-01 Having carefully examined the specifications entitled, "Project No. B-22-009-2574, Westside High School Temporary Classrooms, Richmond County", and the drawings similarly entitled, numbered, all dated 04/05/2024 and addendum (a) Nos. _____, as well as the premises and conditions affecting the work, the undersigned proposes to furnish all services, labor and materials called for by them for the entire work, in accordance with said documents for the sum of:

DOLLARS (\$ _____)
which sum is hereafter called the "BASE BID"

B-02. The undersigned further proposes that should any of the following alternates or unit prices be accepted and is incorporated in the contract, the Base Bid may be altered if elected by the Owner as follows:

N/A

- B-03 a) If rock, boulders, weathered shale or other unsuitable materials as defined in the General Conditions is encountered by the contractor during the general overall grading operation, the Owner will pay the contractor \$ _____ per cubic yard for the removal and disposal of said materials off site.
- b) If rock, boulders, weathered shale or other unsuitable materials as defined in the General Conditions is encountered by the contractor during the trench excavation, the Owner will pay the contractor \$ _____ per cubic yard for the removal and disposal of said materials off site.
- c) The quantity of rock, boulders, weathered shale or other unsuitable materials as defined in the General Conditions will be as computed by the architect on the basis of measurements taken by the architect—excavation of said unsuitable materials is to be carried out only when authorized by the architect.
- d) Rock payment lines are limited to the following:
1. Two feet outside concrete work for which forms are required, except footings.
 2. One foot outside perimeter of footings
 3. In pipe trenches, 6 inches below invert elevation of pipe and 2 feet wider than inside diameter of pipe, but not less than 3 feet minimum trench width.
 4. Outside dimensions of concrete work where no forms are required.
 5. Under slabs on grade, 6 inches below bottom of concrete slab.

B-04 For and in consideration of the sum of \$1.00, the receipt of which is hereby acknowledged, the undersigned agrees that this proposal may not be revoked or withdrawn after the time set for the opening of bids but shall remain open for acceptance for a period of thirty-five (35) days following such time

B-05 In case he be notified in writing by mail, email, or delivery of the acceptance of this proposal within thirty-five (35) days after the time set for the opening of bids, the undersigned agrees 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 equal to 100% of the contract sum. Contractor shall also provide the required certificates of insurance (in accordance with Article E-27 of the General Conditions). Contractor will also provide a list of subcontractors, noting their business trade, estimated value of their work and business classification (MBE/WBE) for the Local Participation Report to the Board.

B-06 The undersigned agrees to commence actual physical work on the site with an equal force and equipment within ten (10) days after the notice-to proceed by the owner and to complete in 90 consecutive calendar days from and including said date.

B-07 Enclosed herewith is a bid bond in the amount of _____ Dollars (\$ _____)
being not less than 5% of the Base Bid.

The undersigned agrees that the above stated amount is the proper measure of liquidated damages which the Owner will sustain by the failure of the undersigned to execute the contract and to furnish the performance bond and the payment bond in case this proposal is accepted and further agrees to the following:

B-08 If this proposal is accepted within thirty-five (35) days after the date set for the opening of bids and undersigned fails to execute the contract within ten (10) days after written notification of such acceptance or if he fails to furnish both a performance bond and a payment bond, the obligation of the bid bond will remain in full force and effect and the money payable thereon shall be paid into the funds of the Owner as liquidated damages for such failure; otherwise the obligation of the bond will be null and void.

B-09 The following subcontractors are listed for review by the Owner and Architect.

1. Plumbing _____
2. Mechanical _____
3. Electrical _____
4. Roofing _____
5. Sitework _____

B-10 The bidder submits the following statement of bidder's qualifications: (see next page)

B-11 The bidder submits the attached E-Verify Contractor Affidavit.

B-12 The bidder submits the attached Sex Offender Acknowledgement Form

Certified Checks Not Acceptable

STATEMENT OF BIDDER'S QUALIFICATIONS

To accompany bids submitted for
Augusta, Georgia

Name of Bidder _____

Business Address _____

Phone Number _____ Fax Number _____

When Organized _____

Where Incorporated _____

Type of Business: General Contractor _____

Subcontractor _____

Other _____

Credit Available for this Contract \$ _____ *

Contracts now in Hand \$ _____ *

* Within ten calendar days after bid date and prior to the award of the construction contract the contractor must furnish Program Manager/Owner a current audited financial statement.

Plan of Organization (Proprietorship, Partnership, Corporation)

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

(True _____) (False _____)

The Bidder has never declared in default on a contract.

(True _____) (False _____)

By signing this document, I (the bidder) certify that construction, under this company's name, is my primary means of business and employment.

Remarks: _____

(The above statements must be subscribed and sworn to before a Notary Public).

Date _____

Firm Name _____

By _____

Title _____

(Notary Public)

Respectfully submitted,

Name _____

Address _____

By _____

Title _____

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

The legal name of the bidder is:

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

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

Federal Work Authorization User Identification Number

Date of Authorization

Name of Contractor

Name of Project

Richmond County Board of Education
Name of Public Employer

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

Executed on _____, _____ 20____ in _____(city), _____ (state).

Signature of Authorized Officer or Agent

Printed Name and Title of Authorized Officer or Agent

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

NOTARY PUBLIC

My Commission Expires:

Sex Offender Acknowledgement Form

Read, sign and return this form to the Richmond County Board of Education

The Contractor (or Vendor) shall not knowingly send any employee, agent or subcontractor personnel who is a registered sex offender or who has been convicted of sexual abuse to any school building or school property when students are attending school or a school related activity.

The Contractor (or Vendor) shall make periodic criminal history record inquiries as authorized by O.C.G.A. §35-3-34, as now written, or here-after amended; or allowed by all or any other laws allowing such inquiry, to identify these persons who have been convicted of sexual abuse or any other act which would require such person to be entered into a national or state sexual offender registry.

For the purpose of this policy, the term periodic shall mean that the criminal history record inquiries shall be made current upon the awarding of a successful bid on contract and checked no less than annually during the duration of the contract.

Upon notification and acceptance of the bid, the Contractor (or Vendor) shall certify to the Richmond County Board of Education that periodic criminal history record checks are made by the company for all employees and that to the best of the Contractor's (or Vendor) knowledge it has no employee or agent who has been convicted of a sex offense or who is a registered sex offender, who will be assigned to any school building or school property while students are attending school or a school related activity.

I have read and understand the above Richmond County Board of Education Policy regarding my or my company's obligation as a contractor (or vendor). I further acknowledge that the failure to comply with the requirements to identify a sex offender, to comply with any part of this policy, to assign a sex offender to any school building or school property while students are attending school or a school related activity will constitute a breach of the contract.

Contractor (or Vendor) signature

Date signed

Witness signature

Date signed

SECTION C

INSTRUCTIONS TO BIDDERS

C-01. Basis of Contract. - See invitation to bid and proposal form. (See also Article E-45)

C-02. Bid Security. - See invitation to bid and proposal 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 proposals, 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 covered in the proposals, and in closing the contract they will become a part thereof. (See also Article E-45) It is the Program Manager/Owner's preference to have all addenda's distributed to all bidders at least three (3) working days prior to the bid date.

C-04. Proposals. - (a.) - Proposals 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 and must be signed. All blanks on the proposal form must be filled in. Three loose copies are furnished bidders for their use. 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 proposal in the form requested 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 proposal form shall be considered sufficient cause for rejection of a proposal.

(c.) - Proposals are to be addressed to the owner at the address and room number shown in the advertisement for bids and must be enclosed in an opaque, sealed envelope marked with the name and number of the job and identified with the words "Proposal for Construction". Bids are to reach the address designated in the invitation for bids not later than the hour and date named in the invitation for bids. After that time no bids may be received.

(d.) – Alternates:

(1) Deductive alternates may be used to reduce the base bid; if used, deductive alternates will be prioritized and exercised in numerical sequence as used in the bid documents.

(2) Additive alternates may be used; if used they may be exercised in any order.

(3) The Project shall be awarded by the base bid less any deductive alternate selected (if any); plus any Additive alternates selected (if any). To be clear, any deductive alternates and/or additive alternates selected will be used to determine the low bid.. (See Article E-47)

(e.) - Proposals 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.

C-05. Examination of Site. - The bidder's attention is directed to Article E-15.

C-06. Contract Form and Bonds. - The bidder's attention is directed to Article B-05.

C-07. Award. - The owner reserves the right to reject any or all bids and to waive technicalities and informalities. (See also Article C-01)

C-08. - Surety and Insurance Companies. - The contract provides that the surety and insurance companies must be acceptable to the owner. To avoid inconvenience, any bidder or subcontractor should get in touch with the owner to determine whether the surety or insurance companies expected to be used on the work are acceptable to the owner. (See also Articles E-27 and E-30)

C-09. - 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.

IMPORTANT

C-10. Trade Names. - The attention of bidders and all other parties is called to the procedure under Article E-03 of general conditions for the submission of trade names, brand names, or names of manufacturers for approval which aforesaid procedure is used in place of what is commonly known as an "or equal" provision.

NOTES:

1. Before submitting a bid, each bidder shall examine the Drawings carefully, shall read the Specifications and all other Contract Documents, and shall visit the site of the Work. Each bidder shall fully inform himself prior to bidding as to existing conditions and limitations under which the Work is to be performed, and shall include in his bid a sum to cover the cost of items necessary to perform the work as set forth in the proposed Bidding Documents. The Bidding Documents have been prepared on the basis Of surveys and inspections of the site and physical conditions at the site. This, however does not relieve the Bidder of the necessity for fully informing himself as to the existing physical conditions. No allowance will be made to a bidder because of lack of such examination or knowledge. The submission of a bid will be considered as conclusive evidence that the bidder has made such examination.

2. Bidder has secured on-site measurements for quantities upon which Bidder's proposal is based and has observed all existing conditions and limitations.
3. Each bidder, when required, shall obtain a Contractor's license under the provisions of the Georgia Contractor's Licensing Law. Specialty Contractor's Licenses can be obtained for the various building trades and information regarding these licenses can be obtained from the Georgia Licensing Board for Contractors.
4. Attention is directed to the fact that these specifications include a set of Bid Forms. These are for the convenience of bidders and are not to be detached from the Specifications, or filled out, or executed. Separate copies of Bid Forms are furnished for that purpose, in triplicate, two to be submitted with the Bid and one to be retained by the bidder for his records. Architects instructs bidders to use this form and no other. Do not add to the form with any change.

The Contractor, by signing the Contract, acknowledges that he is aware of and familiar with the contents and requirements of the following acts and executive orders:

1. High Voltage Act, Georgia Law 1960, pp181-183
 2. Underground Gas Pipe Law- Georgia Law 1969, pp50-57
 3. William Steiger Occupational Safety and Health Act of 1970
 4. The non-discrimination clause contained in Section 202 Executive Order 11246 as amended by Executive Order 11375 related to Equal Employment Opportunity for all persons without regard to race, color, religion, sex, or national origin and the implementing rules and regulations described by the Secretary of Labor are incorporated.
 5. The act entitled "State Employees and Officials- Trading with the "State", Georgia Laws, 1956,pp.et seq
 6. Contractors must e-Verify their employees and all subcontractors in accordance with O.G.C. 13-10-91 and provide affidavits for themselves and subcontractors as required by Chapter 300-10-1 of the Georgia Department of Labor Code.
5. **DUTY TO PROTECT:** The Contractor (or Vendor) shall not knowingly send any employee, agent or subcontractor personnel who is a registered sex offender or who has been convicted of sexual abuse to any school building or school property when students are attending school or a school related activity. The Contractor (or Vendor) shall make periodic criminal history record inquiries as authorized by O.C.G.A. §35-3-34, as now written, or here-after amended; or allowed by all or any other laws allowing such inquiry, to identify these persons who have been convicted of sexual abuse or any other act which would require such person to be entered into a national or state sexual offender registry. For the purpose of this policy, the term periodic shall mean that the criminal history record inquiries shall be made current upon the awarding of a successful bid on contract and checked no less than annually during the duration of the contract. Sex Offender Acknowledgement Form is to be executed and included in the bid as provided in the SECTION B – Form of Proposal
 6. In submitting a proposal, the bidder certifies that the provisions of the act entitled "State Employees and Officials- Trading with the State," Georgia Laws 1956, pp et seq. Have been complied with."
 7. The drawings, Specifications and other documents furnished to bidders are the property of the Owner.
 8. Return bidding documents to the address of the Architect as listed in the Directory. In returning bidding documents, include dated transmittal.

9. Each bidder shall carefully examine Drawing and Specifications and all Addenda or other revisions thereto and thoroughly familiarize himself with the detailed requirements thereof prior to submitting a proposal. If any bidder is in doubt as to the true meaning of any part of the Drawings, Specifications or other documents, or if any error, discrepancy, conflict or omission is noted, the bidder should immediately submit a written request for information to the Program Manager.

The Program Manager will forward all such request to the Architect for clarification of the intent of the documents and/or correction of such error, discrepancy, conflict or omission and will notify all bidders by Addendum in cases where the extent of the work of the cost thereof will be appreciably affected. No allowance will be made after the bids are received for oversight by a bidder

10. Any explanations desired by bidder regarding the meaning or interpretation of the drawings and specifications should be requested in writing to the Architect.
11. "Oral explanations or instructions given before the award of the Contract will not be binding. Any interpretations made will be in the form of a Addendum to the Specifications or drawings and will be furnished to all bidders and its receipt by the bidder will be acknowledged on the form of proposal in the space provided."
12. The following products do not require further approval except for interface within the work: Products specified by reference to standard specifications such as ASTM and similar standards.
13. Bid Bonds will be returned to all except the three lowest bidders within ten days after formal opening of bids. The bid bonds of the three lowest bidders will be returned within 48 hours after Owner and Contractor have executed a Contract and the executed performance bond and payment bond has been approved by the Owner, or, if no award has been made within 60 days after the opening of bids, upon the demand of the bidder at anytime thereafter, so long as he has not been notified of the acceptance of this bid
14. It is strongly urged that all bidders deliver the bid to the location of the bid opening as indicated on the Invitation/Advertisement for Bids. Bidder is solely responsible for insuring delivery of bid to the proper location at the proper time. Delivery of bids which are mailed or otherwise transmitted to the Owner, Architect and Program Manager at a location other than the location of the bid opening indicated on the Invitation/Advertisement for Bids will not be guaranteed. Program Manager/Owner prefer bids to be hand delivered to place of bid. Bids faxed will not be accepted.
15. The owner reserves the right to accept or reject any and all bids when such rejection is in the interest of the Owner; to reject the bid of the bidder who has previously failed to perform or to complete on time Contracts of a similar nature; and to reject the bid of a bidder who is not, in the opinion of the Architect and Program Manager or Owner, in a position to perform the Contract. The Owner reserves the right to reject any subcontractor who has previously failed to perform properly in the opinion of the Architect, Program Manager or the Owner.
16. The Owner will follow the State of Georgia guidelines when considering award of contracts. The Project shall be awarded by the base bid less any deductive alternate selected (if any); plus any Additive alternates selected (if any). To be clear, any deductive alternates and/or additive alternates selected will be used to determine the low bid.

17. Proposals for each contract will be accepted from bidders who are regularly engaged in the work they are bidding, which represents a significant portion of their total volume and who perform this work with men regularly employed on their payrolls. Before a bid is considered for award, the bidder may be requested by the Architect or Program Manager to submit a statement of facts in detail as to his previous experience in performing similar or comparable work and of his business and technical organization and financial resources and plant available to be used in contemplated work. The bidder may also be required to submit a statement of facts in detail on his proposed subcontractors as to their previous experience and past performance on performing similar work or comparable work .
18. Failure to furnish bonds in a form satisfactory to Owner shall subject bidder to loss of time from the allowable construction period equal to delay time in furnishing material. The Owner reserves the right to reject the qualifications of any bonding company.
19. The bidder to whom the Contract is awarded shall, within ten calendar days after notice of award and receipt of Agreement forms from the Owner, sign and deliver required copies to the Owner.
20. At or prior to delivery of the signed Agreement, the bidder to whom the Contract is awarded shall deliver to the Owner those Certificates of Insurance required by the Contract Documents. The successful bidder will not be permitted to occupy the site of the work or allowed on the property of the Owner until Certificates of Insurance has been approved and the written Notice to Proceed is issued. Failure to furnish policies or Certificates in a form satisfactory to Owner shall subject Bidder to loss of time from the allowable construction period equal to delay time in furnishing material.
21. Not Used
22. A Pre-bid Conference will be held at the **Media Center Conference Room, Westside High School, 1002 Patriots Way, Augusta, GA 30907 at 10:00 A.M., April 24, 2024.** Pre-Bid Conference is not mandatory. Bidders are urged to attend.
23. The Architect wishes to call to the attention of the bidder that any set of plans and specifications not returned in good condition, such bidder will not receive his refund for same.
24. The General Contractor is responsible for obtaining and paying for **ALL** necessary permits, license, fees, electrical, sewer & water tap fees, etc., in connection with the completion of this contract.
25. The General Contractor and each Subcontractor and Material Supplier, must furnish an Affidavit similar to the following forms. These Affidavits must be delivered to the Architect within thirty (30) days after completion of work.

See Part 1, Division C. Pages C-6 through C-17 for Affidavit and Specimen Copy Forms.

SECTION D

INDEX TO GENERAL CONDITIONS

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SECTION E

GENERAL CONDITIONS

Article E-01. The general conditions of the contract, Articles E-01 to 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 (NAME OF OWNER), owner”.

The architect has no authority to amend the general conditions orally or in writing either expressly or by implication.

NOTES:

Article E-02. Omitted

NOTES:

Article E-03. Trade Names. - 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 contract documents, application for the approval of the use of such products must reach the hands of the architect at least five (5) 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 architect from adding trade names, brand names or names of manufacturers by addendum. The burden of proving acceptability of a proposed product for use in place of a product or products designated by trade name or names, brand name or names, or by the name or names of manufacturers in the contract documents rests on the party submitting the request for approval. The written application for approval of a proposed product 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 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 contract documents. 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. 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.

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. Unless requests for approvals of other products have been received and approvals have been published by addendum in accordance with the above procedure, the successful bidder may furnish no products of any trade names, brand names, or manufacturers' names except those designated in the contract documents. 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.

NOTES:

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 Article E-71 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.

(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 furnishes materials not so worked.

(d) *Notices.* - Written notices 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 also Article E-49)

(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 skilled workmen or enough materials or proper materials, the order of condemnation in such event being based on Article E-46, q.v. and upon the definition of work as set forth under Article E-1(e), q.v. (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 the contractor.

(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 Case (a), Case (b), or Case (c) of Article E-15 or in accordance with Subparagraph (l) of 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, and the change 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 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*. - 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 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-references and Citations of Articles and Paragraphs of the General Conditions.* - 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 the 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.

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

(a) *Identification.* - The architect shall identify the contract documents.

(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 standards. (See also Article E-9) In the event the architect shall have used such phrases anywhere in the specifications as : "Work indicated on the drawings and herein specified", "work shown and specified", "in accordance with drawings and applicable specifications", "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 defensible of the provisions under the present article of the general conditions, and they are not to be a requirement under the contract. Any of the aforesaid conjunctive expressions and phrases or any cross-references 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, and E-45)

NOTES:

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. All 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 shall prepare a critical path 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 architect shall furnish them in accordance with that schedule.

NOTES:

1. Unless Otherwise specifically stated, all manufacturer's catalogs, specifications, instructions or other information or literature that are referred to in the Specifications will be considered as the latest edition and/or revision of such publication that is in effect on the date of the Invitation or Advertisement for Bids.
2. When standard specification such as the American Society for Testing and Materials, Federal Specifications, Department of Commerce (Commercial Standards), American Institute of Steel Construction, or other well-known public or trade associations, are cited as a starboard to govern materials and/or workmanship, such specifications or portions thereof as referred to will be equally as binding and have the full force and effect as though it were copied into these specifications. Such Standards as are mentioned as generally recognized by and available to the trades concerned. The Contractor will refer to Section 01095- Reference Standards and Definitions for locations and address where this information may be obtained. Unless otherwise specifically stated, the standard specifications referred to will be considered as the latest edition and/or revision of such specifications that is in effect on the date of the Invitation for Bids. In case of any conflicts between standard specifications and the written portion of the Specifications, the specifications as actually written herein will govern.

Article E-3.1 Schedules:

CONTRACTOR'S CONSTRUCTION SCHEDULES

The Contractor, within ten (10) Calendar days after Notice to Proceed or Contract Award shall prepare and submit for the Program Manager's approval a Contractor's Construction Schedule for the Work which shall provide for expeditious and practicable execution of the work. This critical path schedule shall contain milestone dates and will be coordinated and approved by the Program Manager, Architect and the Owner prior to the contractor's submittal of the first month's application to the Architect. **The first application for payment will not be processed unless the schedule is approved by the Architect, Program Manager and Owner.**

The Contractor's Construction Schedule will be developed by the Contractor according to the Critical Path Method (hereinafter referred as CPM). The requirement for CPM is included to ensure adequate planning and execution of the Work. And to assist the Program Manager and Owner in appraising and evaluating the progress of the Work. The Schedule shall be a detailed graphic representation of all significant aspects of the Construction Plan.

The Schedule shall be a computer-produced report utilizing compatible software approved by the Program Manger. The Schedule data shall be categorized in such way as to indicate components of work as directed by the Program Manager and Owner.

The Schedule shall indicate a late completion date for the Project that is no later than the Project's required completion date. All activity dates shall be given in calendar days. For all major equipment and materials fabricated or supplied for this project, the Schedule shall show a sequence of activities including:

- Preparation of Shop Drawings and Sample submissions
- Review of Shop Drawings and Samples
- Shop Fabrication and delivery
- Erection and/or installation
- Project close-out

If the Contractor determines that they can perform work in less time than indicated in the bidding documents, the contractor may schedule the work accordingly, but no claims will be allowed for delay, disruption, acceleration or other costs to the reduced time schedules until times of completion as stated in the Bidding Documents have occurred.

Within five (5) calendar days of submission of the Schedule, the Contractor and his major Subcontractor shall participate in a conference with the Program Manager to review and evaluate the Schedule. Any revisions necessary as a result of this review shall be resubmitted within seven (7) calendar days after the conference. After approval, the Contractor shall provide the following to the Program Manager:

- a. Three (3) copies of the completed Detailed Construction Progress Schedule in a graphic CPM Format
- b. Three (3) copies of the completed Detailed Construction Progress Schedule tabular reports indicating Activity Number, Activity Description, Activity Duration, Early Start, Early Finish, Late Start, Late Finish, and Total Float.
- c. A data diskette of the Detailed Construction Progress Schedule

The approved Detailed Construction Progress Schedule shall then be signed by the Contractor and shall then become the Baseline Schedule which the Contractor shall use in planning, organizing, directing, coordinating, performing and executing the Work. (including all activities of Subcontractors equipment vendors, and suppliers), and shall be the basis for evaluating the Progress of the Work.

SCHEDULE UPDATES- The Contractor shall be responsible for providing and submitting to the Program Manager CPM Schedule updated on a **monthly basis** on a date to be determined by the Program Manager. The monthly submission will include items a., b., and c., mentioned in the above article. The Contractor shall also submit to the Program Manager a **weekly “Look Ahead” schedule** prior to the weekly coordination meeting.

The Contractor’s detailed schedule must reflect the normal anticipated adverse weather delays on all weather dependent activities. Anticipated adverse weather conditions will be based on Historical Data for the Augusta, Georgia Airport weather station.

MONTHLY ANTICIPATED ADVERSE WEATHER CALENDAR DAYS SCHEDULE

JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.
(5)	(5)	(4)	(2)	(3)	(3)	(4)	(3)	(3)	(3)	(3)	(5)

The sequencing and duration of activities within the Schedule shall indicate the amount of float. Float is defined as the amount of time between the Early Dates and the Late Dates of each activity or sequence of activities. Total float is defined as the amount of time any given activity or path of activities may be delayed before the project completion is affected. Float time will not be for the exclusive use of the Contractor, but will be used in the best interest of the completion of the Project within the specified time frame.

Extensions of time for performance or manpower will be granted only to extent that approved changes and/or unusual adverse weather and force majeure exceeds the total float in the affected activity or path of activities at the time approval was issued for the change.

Five (5) calendar days prior to the date of each Contractor’s Application for Payment the Contractor’s Project Manager and Superintendent shall meet with the Program Manager at the job site to review actual progress on the Work. At that meeting, unless excluded from the Scope of Work, the Contractor shall provide the following written reports:

1. Progress Report: It will show the activities, or portions of activities, completed during the reporting period, and the progress along the critical path in terms of days ahead or days behind. The Progress Report shall also contain a narrative report which shall include a description of problem areas, current and anticipated delaying factors and their impact, an explanation of corrective action to be taken and any proposed logic for a Recovery Schedule. In preparing each Progress Report, the Contractor is required to meet with all concerned Subcontractors and suppliers whose work is described in, affected by, or related to the Progress Report.
2. Schedule Report: It shall include the following minimum information for each activity and should be sorted by activity, remaining float (from the least to the most) and late start date (in chronological order):
 - a: Activity Number
 - b: Activity Description
 - c: Estimated Duration in Days
 - d: Early and Late Start Dates
 - e: Early and Late Finish Dates
 - f: Percentage Completion of Duration
 - g: Remaining Float/Days Behind Schedule

3. Preliminary Contractor's Application for Payment. Contractor, Architect and Owner, at this time will review preliminary Application for Payment and approve this preliminary request prior to Contractor finalizing formal monthly Application for Payment.

Monthly Applications for Payment will NOT BE REVIEWED OR PROCESSED without an updated construction schedule reflecting adjustments to contract time, individual values noted on the schedule and projected billings.

In all of the foregoing reports, actual start and finish dates should be indicated for each activity that has started or finished. Completed activities shall be omitted from Remaining Float and Late Start sorts.

If at any time during the prosecution of the Work any of the following conditions should exist, the Owner and/or Program Manager may require that the Contractor, at no extra cost to the Owner, prepare and implement a Recovery Schedule to explain and display how he intends to regain compliance with the Detailed Construction Progress Schedule during the immediate subsequent pay period. Notwithstanding the above, the Contractor's responsibilities hereunder shall be limited to critical path activities and all designated Milestone dates or activities.

- a. Should the Contractor's Daily Reports or Progress Reports indicate that in the opinion of the Program Manager a Recovery Schedule is required.
- b. Should the Detailed Construction Progress Schedule and Schedule Report sorted by Early Finish show the Contractor to be seven (7) or more days behind schedule on critical path activities or any designated Milestone Dates or activities at any time during construction up to thirty (30) days prior to schedule Substantial Completion
- c. Should the Detailed Construction Progress Schedule and Schedule Report sorted by Early finish show the Contractor to be three (3) or more days behind schedule on critical path activities or any designated Milestone Date or activities at any time during construction up to thirty (30) days prior to schedule Substantial Completion.
- d. Should the Contractor make changes in the logic of the Detailed Construction Progress Schedule which, in the opinion of the Owner and/or the Program Manager are of a major nature.

The Contractor shall do the following after determination of the requirement for a recovery schedule:

- a. Within five (5) calendar days, the Contractor shall complete the Recovery Schedule and submit to the Program manager for review. The Recovery Schedule shall represent the Contractor's best judgment as to how he shall regain compliance with the Detailed Construction Progress Schedule within the immediate subsequent pay period. The Recovery Schedule shall be prepared to a similar level of detail as the Detailed Construction Progress Schedule and shall have a maximum duration of one (1) month which shall coincide with the pay period.
- b. Within three (3) days, the Contractor shall participate in a conference with the Owner and/or Program Manager to review the Recovery Schedule. Any revisions necessary as a result of this review shall be resubmitted within two (2) days of the conference. The revised Recovery Schedule shall then be the Schedule which the Contractor shall use in planning, organizing, directing, coordinating, performing, and executing the Work. (including all activities of subcontractors, equipment vendors, and suppliers) for its one (1) month duration, to regain compliance with the Detailed Construction Progress Schedule.

Seven (7) Calendar days prior to the expiration of the Recovery Schedule the Contractor will meet with the Owner and the Program Manager at the job site to determine the effectiveness of the Recovery Schedule and to determine whether the Contractor has regained compliance with the Detailed Construction Progress Schedule. At the direction of the Owner and/or the Program Manager, one of the following will happen:

- a. If, in the opinion of the Owner and /or the Program Manager, the Contractor is still behind schedule, the Contractor will be required to prepare another Recovery schedule, to take effect during the immediate subsequent pay period.
- b. If, in the opinion of the Owner and /or the Program Manager, the Contractor has sufficiently regained compliance with the Detailed Construction Progress Schedule, the Contractor will return to the use of this schedule.

CLAIMS FOR EXTENSION OF THE PROJECT SCHEDULE

It is understood that the Owner, Program Manager or Architect/Engineer shall not in any event be liable to the Contractor for delays of any kind whatsoever and the Contractor shall be fully responsible for making up lost time of all delays except to the extent that extensions of time are granted.

If the work is delayed as stipulated of the General Conditions, and the Contractor gives **written notice** of a claim for extension of time as stipulated in the General Conditions, time will be extended by such period as the Program Manager may consider reasonable.

No extension of time shall be allowed **unless a claim is presented in writing** to the Program Manager. In case of continued cause of delay, only one claim is necessary.

This shall be construed to release the Contractor from the obligation to perform at his own expense all overtime necessary to maintain the Contract completion date where delay have occurred which are not excused. If the Contractor is delayed by any acts of the Owner, Program Manager, Architect/Engineer is granted an extension of time by the Program Manager the Contractor shall comply with the time extension schedule with no additional compensation from the Owner.

Contractor must submit written requests for time extensions within five (5) calendar days from the date of cause for such a time extension request. Any requests beyond this time will be denied by Architect and/or Program Manager.

Article E-4. Copies of Contract Documents Furnished to Contractor. - The architect shall furnish to the contractor, free of charge, such number of copies of contract documents as shall be reasonably necessary for the execution of the work.

NOTES:

Article E-5. Shop Drawings. - (a) *Submission and Approval.* - The contractor shall submit no shop drawings which do not comply with the contract documents. 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 now shall it relieve him from the responsibility for errors of any sort in shop drawings or schedules.

(b) *Schedules.* - The contractor and the architect shall jointly prepare a shop drawing 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.

(c) *Definition.* - 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 Articles E-3(b), E-18 and E-53] --

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 and available to the architect and to his representatives.

NOTES:

Article E-7. Ownership of Drawings and Models. The Drawings, Designs, Specifications, and other documents prepared by the Architect/Engineer for this Project, including electronic files submitted by the Architect/Engineer to the Owner, shall become the property of the Owner, as payment for such Drawings, Designs, Specifications, and other documents are made to the Architect/Engineer pursuant to this Agreement. However, all reserved rights, including the copyright to such documents shall be retained by the Architect/Engineer. The Architect/Engineer's Drawings, Design, Specifications, and other documents prepared for this Project shall not be used by the Owner or others on other projects, for additions to this Project or for completion of this Project by the Owner or others, without prior written consent to such use is given by the Architect/Engineer, unless the Architect/Engineer is in default under this Agreement.

NOTES:

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

NOTES:

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 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 of 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]

NOTES:

1. All items will be installed in a workmanlike manner in accordance with the best recognized practice in the field concerned. Manufactured items will be in strict accordance with the manufacturer's printed directions, specifications and/or recommendations for installation of highest quality. All working parts will be properly adjusted after installation and left in perfect working order. Unless otherwise indicated, items exposed to weather or subject to flooding or wetting will be installed so as to shed and not hold water. Items will in all cases be installed plumb and true and/or in proper relation to surrounding materials.

All materials entering into the construction of the building covered by this Contract including but not limited to those mentioned below, will be securely anchored and/or tied together in accordance with the best recognized practice in the field concerned whether shown, specified or not. Ties and anchors will be best quality for the purpose. Wythes of masonry and corners of masonry walls and partitions will be bonded together if possible unless otherwise specifically shown and where not bonded will be secured with appropriate metal ties or anchors. Masonry walls will be anchored to adjacent columns unless otherwise specifically shown. All wood, steel, concrete or other framing will be securely anchored and tied together and to supporting or abutting masonry. All veneers, finishes, and applied items will be securely anchored and tied to the backing material. The purpose of this paragraph is to insure that, except for expansion joints or otherwise where materials are purposely separated, each and every piece of material entering into the building will be bonded, anchored, tied or otherwise secured in place in a permanent manner that will permit expansion, contraction and other minor movements and normal use of the structure without structural features of the building becoming impaired and without any of its parts becoming loose.

Unless otherwise specifically specified, all items and parts thereof that are made of steel, iron or other ferrous metal that are not galvanized, plated or otherwise specified to be factory finished, will be cleaned and painted with one shop coat of the best quality rust inhibitive metallic primer. After installation, all exposed metal connections and abrasions will be touched up with the same materials as the shop coat and left in good condition for final finishing.

Should a contractor's work requires caulking to complete the finished Product appearance of any item he is installing in the opinion of the Program Manager that Contractor will furnish and install that caulking whether or not called for on plans or in specifications.

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]

NOTES:

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 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) *National Plumbing Code.* - The latest edition of the National Plumbing Code 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 National Plumbing Code and provided also: That there may be no variances from the plans and specifications except to the extent that the said variances shall be necessary in order to comply with the National Plumbing Code. It shall be the responsibility of the contractor to familiarize himself with the requirements of the National Plumbing Code. If there are any express requirements in the plans and/or specifications which are at variance to the National Plumbing Code, all changes in the work necessary to eliminate the said requirements and make the work conform to the National Plumbing Code shall be adjusted as provided in the contract for changes in the work.

(c) *National Electrical Code.* - The latest edition of the National Electrical code with all amendments as 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 of 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 National Electrical Code and provided also: That there may be no variances from the plans and specifications except to the extent that the said variances shall be necessary in order to comply with the National Electrical Code. It shall be the responsibility of the contractor to familiarize himself with the requirements of the National Electrical Code. If there are any express requirements in the plans and/or specifications which are at variance to the National Electrical Code, all changes in the work necessary to eliminate the said requirements and make the work conform to the National Electrical Code shall be adjusted as provided in the contract for changes in the work.

NOTES:

1. The Contractor is solely responsible for the safety of his employees, subcontractors and others in the work area. The Contractor is solely responsible for compliance with all current editions of the State and Federal safety laws, including but not limited to, the latest amendments of the following: Williams-Steigler Occupational Safety and Health Act of 1970, Public Law 91-956, Part 1910-Occupational Safety & Health Standards, Chapter 17 of Title 29 Code of Federal Regulation, Part 1926- Safety & Health regulations for Construction Chapter 17 of Title 29, Code of Federal Regulations

The Contractor will hold weekly meetings with all employees and subcontractors to monitor compliance with all safety regulations. Typed minutes of Safety Meetings will be distributed and filed and will be available for inspection and review.

Contractor will include in his bid all items necessary to comply with OSHA provisions and standards

2. The Contractor agrees to fully comply, when applicable with any and all federal regulatory agency, state or local laws and regulations concerning the transport, storage, and handling of any hazardous substance or materials and to notify the Program Manager three (3) days prior to delivery of any hazardous or harmful substance or materials to the project.

The Contractor also agrees to provide the Program Manager, for the purposes of information, written storage, handling and health instructions and precautions from the manufacturer at the time of notification of delivery. The Contractor will use only competent, knowledgeable workmen trained in the proper handling and storage of these materials and agrees to provide at his expense all safety devices and barriers for his workmen and others as recommended by the manufacturer or that may be deemed necessary by an appropriate governing agency and/or the Program Manager. The Contractor will not under any circumstances dispose of any hazardous substances or containers on the owner's property of facilities. Methods of disposal of these hazardous materials or containers must be in a manner as prescribed by law. The Contractor assumes total liability and responsibility for the handling, storage and disposal of these hazardous materials and indemnifies the Owner, Architect and Program Manager of and from liability, claims, and demands for bodily injury and property damage arising out of the use of the hazardous materials by this Contractor and his agents

The Contractor will ensure a copy of all OSHA Hazardous Communications information is on site and available to the Program Manager

The Contractor will indemnify and hold harmless the Owner, Program Manager and Architect from all claims and citation arising from the Contractor's non-compliance with the safety regulations and laws as listed in paragraph 10.1.1.1, including non-compliance of his employees, his subcontractors and such independent contractors which he may employ.

The Owner reserves the right to perform any work on the site necessary to correct any conditions which pose a hazard to the health or safety of pupils, teachers, administrators or the general public.

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 provisions of the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc., 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 operation. 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 of the work or of adjoining property, the contractor, without special instruction or authorization from the architect or owner, is hereby permitted to 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, such blasting shall 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 rain water, surface water, and back-up of drains and sewers. The contractor shall furnish all labor, pumps, shoring, enclosures, and equipment necessary to protect and to keep the work free of water.

(f) *Underground Gas Pipe Law.* - The contractor by signing the contract acknowledges that he is fully aware of the contents and requirements of *Georgia Laws 1969, Pages 50 and following, and any amendments and regulations pursuant thereto*, (the preceding italicized requirements being hereinafter referred to as the "underground gas pipe law"), and the contractor shall comply therewith. The contractor acknowledges that the contractor is the "person" defined in the above-mentioned underground gas pipe law (a) who will engage in the activities which are regulated thereby, (b) who is required to examine maps filed pursuant thereto, (c) who is required to give written notices to gas companies in accordance therewith, (d) who is required to receive written statements from gas companies as prescribed thereby, and (e) who is to perform and do certain things referred to therein *only* after observing the precautions with respect to underground gas pipes and facilities which are prescribed therein. These provisions of the contract do not repeal the restrictions under Subparagraph (d) of Article E-12 of the general conditions nor do they 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 underground gas pipe law 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.

(g) *High Voltage Act.* - The contractor by signing the contract acknowledges that he is fully aware of the contents and requirements of *Act No. 525, Georgia Laws 1960, Pages 181 and following, any amendments thereto, and Rules and Regulations of the Commissioner of labor pursuant thereto* (the preceding italicized requirements being hereinafter 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 local power provider/company 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 locate (a) on the site and (b) on any area or areas onto which the contract documents require or permit the contractor wither 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 and the foregoing provisions supplement Articles E-12 and E-27 of the general conditions. the contractor agrees that the foregoing 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 Georgia Laws 1967, p. 792, as amended; Ga. Code Ann. Sections 54-406 through 54-411. He acknowledges and agrees likewise that he will comply with the aforesaid law.

NOTES:

Article E-13. Inspection of Work. - (a) *Access to Work.* - The architect and his representatives and owner 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-examinations 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 subcontractor shall pay such cost unless he shall show that the defect in the work was caused by another sub-contractor, and in that event the owner shall not pay such cost. Contractor shall "back charge" subcontractor, not charge Owner for testing. Cost shall flow to party that caused defective work. 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 provide 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, resident engineer inspector, clerk-of-the-works, engineers employed by the architect, representatives of the architect, or the architect shall in no 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 Starts.* - 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"]

NOTES:

1. During the progress of the work, the Program Manager and/or the Architect shall inspect the work for conformance to the Contract Documents. Should the inspection reveal work that is not nonconformance with the Contract Documents, and if the nature of the non-conformance so warrants, the Program Manager and/or the Architect will issue a written deficiency list which will stipulate the item or items of work which are non-conforming and will specify a reasonable time for the deficient work to be brought into conformance with the Contract Document.

The Contractor, upon receipt of the deficiency list will implement corrections within the stipulated time, and will notify the Program Manager and/or Architect in writing that the work has been corrected and request inspection.

Upon receipt of the Contractor's request for inspection, the Program Manager and/or Architect will inspect the corrective work, and, if the work is satisfactory, the deficiency list will be rescinded. During the time period that the deficiency list is in effect, the Program Manager and/or Architect may withhold certification for payment as stipulated in subparagraph until the deficiency list is rescinded or, if in the opinion of the Program Manager and/or Architect, the Contractor is making a good faith effort to correct the deficiency..

Until the work is fifty percent (50%) complete, the Owner will pay Ninety percent (90%) of the portion of the amount due on account of progress payments.

At the time the work is fifty (50%) complete and providing that the Contractor is on or ahead of the schedule as determined by the Program Manager and/or Architect and the work is satisfactory and in the absence of other good sufficient reasons, the Contractor may request in writing, and prior to pay application, that the retention be reduced to five percent (5%) of the amount due. Accompanied with the written request of retainage reduction the Contractor shall submit AIA G707 A, Consent of Surety to Reduction in or Partial Release of Retainage, latest edition.

The full contract retainage may be reinstated if the manner and progress of the work does not remain satisfactory to the Program Manager and/or Architect.

Article E-14. Superintendent 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 cease 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 not be held responsible for their existence or discovery.

-- [See also Articles E-3, E-40, and E-41] --

NOTES:

1. The Contractor's Superintendent shall be a competent representative, capable of the following (1)Supervision of tradesmen; (2) Reading and interpreting the Contract Documents; (3) Orderly coordination of this work with the Construction Manager and Architect in the daily execution of the work; (4) Laying out his work; (5) Representing the Contractor with the Owner, Program Manager and Architect in the daily execution of the work; (6) Controlling and establishing good quality in the completed work.

The Contractor's representative shall be the sole supervisor of the Contractor's Labor Force. He shall attend the regularly scheduled progress meeting on-site, keep himself and his company informed of scheduled requirements, safety hazards and general job conditions. He shall plan and pursue the work under his supervision in a professional and expeditious manner.

The Contractor's Superintendent shall be present at the job site whenever work is being performed by his own forces or by his subcontractor's forces.

The Contractor shall submit, prior to starting work on the project, a resume of the superintendent to be employed on the work. Assignments of superintendents shall be subject to approval by the Program Manager/Architect.

The Program Manager/Architect reserves the right to review the performance and competence of the Contractor's Superintendent and the Superintendents of the Contractor's major subcontractors. In the event that the performance of the Contractor's superintendent or the superintendents of the Contractor's major subcontractor's is judged to be detrimental to the project and that the superintendent's removal will be in the best interest of the Owner's, other Contractors, and the project; the Program Manager/Architect shall request the superintendent's removal in writing. The Contractor shall, upon receipt of written notice, remove the superintendent, or request his major subcontractor to remove the superintendent, from the project within two weeks and provide a suitable replacement.

Article E-15. Changes in the Work. - (a) *Owner's Right to Make Changes.* - The owner without invalidating the contract may authorize or order work or may authorize or order changes by altering, adding to, or deducting from the work, the contract sum being adjusted accordingly. 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 from. [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. Lump Sum must be accompanied by cost breakdown by material, labor and taxes, with overhead and profit broken out so costs and charges can be verified by Architect and/or Program Manager.

CASE (b) By unit prices named in the contract or subsequently agrees upon. Unit prices are net. 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. The Owner is NOT OBLIGATED to use the unit prices listed on the Contractor's bid form for changes involving changes which may involve unit prices listed on the Contractor's bid form. The Owner may elect to use CASE (a) or CASE (c) to determine the cost of a change if it determines CASE (b) unit costs do not represent a fair or accurate means of determining the cost of a change.

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) 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) *Subsurface Conditions.* - Material below the surface of the earth is assumed to be earth and other material that can be removed by power shovel or similar equipment. Should conditions encountered below the surface of the ground be at variance to conditions indicated by drawings or specifications [See also Article E-15(g)], the contract sum shall be adjusted as provided in the contract for changes in the work upon claim by either party made in writing within a reasonable time after the first observance of the conditions, PROVIDED: That the contractor shall in any event give written notice to the Authority before proceeding to execute any change resulting from subsurface conditions and, PROVIDE FURTHER: That, except as referred to hereinbelow the owner shall not be liable to the contractor for any claim occasioned by the aforesaid subsurface conditions except in accordance with and pursuant to authorization of the owner issued in writing prior to commencement of execution of the aforesaid change to which authorization the contractor shall have taken no exception. If exception to the authorization be taken by the contractor the owner may issue an order pursuant to Article E-15(i).

Commencement of execution of work pursuant to Article E-15(i) shall not exclude the recovery of damages by the contractor under other articles of the general conditions, but the cost to the owner for the changes executed pursuant to the aforesaid order shall not exceed the "net allowable expenditures" permitted to the contractor under Article E-15(h) plus the "allowance for overhead and profit" permitted under Article E-15(h).

(f) *Rock.* - If rock, as hereinafter defined, is encountered, no claim for additional compensation for changes shall lie against the owner in the absence of previous authorization by the owner in writing, and the cost to the owner for any changes shall be determined as provided in the contract for changes. CAUTION: No rock for which extra compensation is expected to be received shall be removed except pursuant to and in conformity with a written authorization or order of the owner. No removal of rock as defined herein shall be included in the base bid. *Rock is defined as follows:* (1) Material requiring blasting, (2) boulders of one-half cubic yard or more, (3) material which cannot be removed by power shovel or similar equipment, as stated herein, shall include, but not be limited to the following: For Trenches and Pits: A track-mounted power excavator, equivalent to Caterpillar Model No. 215clc, and rated at not less than 115 HP flywheel power and 32,000 pound drawbar pull and equipped with a short stick and a 42 inch wide, short tip radius rock bucket rated at 0.81 cubic yard (heaped) capacity. Trenches in excess of 10 feet in width and pits in excess of 30 feet in either length or width are classified as open excavation.

For Open Excavations: Caterpillar Model No. 973 or equivalent track-mounted loader, rated at not less than 21 OHP flywheel power and developing minimum of 45,000 pound breakout force (measured in accordance with SAEJ732) or (4) material requiring removal by pneumatic tools or by the use of bars or sledges. Shale, rotten stone, or stratified rock that can be loosened with a pick or removed by power shovel or similar equipment shall not be classified as rock. "Intermittent drilling, blasting, or ripping to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation."

(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 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 7.5% 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 workmen'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 superintendent 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), superintendent (except *pro rata* time of foremen as referred to herein), timekeepers, clerks, watchmen, hand tools, small tools, incidental job burdens, 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), Case (b), nor Case (c) 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 service 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, and 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 justly 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 base 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 swear and affirm under the penalties for false swearing 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 therefore; 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 therefore 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 therefore 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(l) 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 claim for payment on account.

(m) *Form and Execution of Change Orders.* - 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, copies of which shall be furnished to any bidder upon request. No claim of the contractor for account of a change shall be due nor shall any such claim appear on a periodical estimate or demand for final payment until (1) the claim 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(l)]

(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 receipt of written request therefore by the contractor from the owner, 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 also indicate the dollar amount of the claim. [See also Articles E-16 and E-39(c)]

(o) *Claims distinguished.* - Claims for damages arising out of alleged negligence of the architect or owner as provide 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. 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 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 (copies of which specimen will be furnished to any bidder on request) 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% 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.

(q) *Unit Prices.* - The term "net" as used in reference to "unit prices" means in respect to all 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.

NOTES:

1. In determining the total cost or credit to the Owner resulting from a change in the Work, the allowances for overhead and profit combined, including the total cost to the Owner, shall not exceed the percentage included in the Owner-Contractor agreement.
2. Only fully executed Change Orders, signed by the Contractor, Architect and Owner may be included in the Application for Payment

Article E-16. Claims. - (a) *Extra cost.* - 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.

(b) *Damages.* - If either party to this contract should suffer damage in any manner because of any wrongful act or neglect of the other party or of anyone employed by the other party, then he shall be reimbursed by the other party for such damage. No claim of the contractor for damages shall be valid unless written notice thereof shall have been received by the owner by registered mail within 15 days after occurrence of the event on which the claim is based. [See also Articles E-15, E-39, and E-41]

(c) *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 from the date of receipt 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 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.

(d) *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, prescribes. He shall not protest a decision or request a conference on the ground merely that a subcontractor, materialman, 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 E36]

(e) *Conference with the Owner.* - (1) *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, not shall such agreement constitute a waiver of any right or defense of the owner. Such a conference is without prejudice to any rights or defenses of the owner. After the conference there will be nothing to confirm since the owner does not engage itself to do or not 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 contractor.

(2) *Conditions precedent to.* - A proposal from the contractor for a conference in respect to (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 provision or 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.

NOTES:

1. All Claims, disputes and other matters in question between the Contractor and the Owner arising out of, or relating to, this Agreement or the breach therefore in the event that the Contractor and the Owner are unable to resolve the dispute through negotiation, shall be tried before a superior court judge to a jury trial and agrees that the venue of the action will be in Richmond County, Georgia. Any legal proceeding arising out of, or relating to, this agreement shall include, by consolidation, joinder, or joint filing, any additional person or entity to the final resolution of the matter in controversy.

The Contractor hereby further agrees that, should any subcontractor or supplier to the Contractor file a claim concerning any dispute or controversy, which involves the allegations of any acts, error or omissions of the Contractor, then the Contractor shall hold the Owner harmless from any and all costs incurred to, legal costs and attorney's fees and payment of any judgment against the Owner.

Should the Owner employ an attorney to enforce any of the provisions hereof, to protect it's interest in any matter arising under this Agreement, or to collect damages for breach of this Agreement, the Contractor agrees to pay the Owner all reasonable costs,, charges, expenses and attorney's fees expended or incurred therein.

Article E-17. Deductions for Uncorrected Work. - If the architect and owner deem it expedient to correct work injured or done not in accordance with this contract, an equitable deduction from the contract price shall be made therefore; but there is not 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 demand that there shall be acceptance of work injured or done not in accordance with the methods and materials designated in the contract documents.

NOTES:

Article E-18. Delays and Extensions of Time. - (a) *Grounds.* - If the contractor is 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 below monthly anticipated adverse weather calendars. Schedule will be used as a guide for the architect's decisions regarding inclement weather.

MONTHLY ANTICIPATED ADVERSE WEATHER CALENDAR DAYS SCHEDULE

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(5)	(5)	(4)	(2)	(3)	(3)	(4)	(3)	(3)	(3)	(3)	(5)

1. The above schedule of anticipated adverse weather will constitute the base line for monthly (or portion thereof) weather time evaluations. Upon acknowledgement of the Notice to Proceed and continuing throughout the contract on a monthly basis, actual adverse weather days above. The term actual adverse weather days shall include days impacted by actual adverse weather days.
2. The number of actual adverse weather days shall be calculated chronologically from the first to the last day in each month. Once the number of actual adverse weather days anticipated in paragraph 1) above has been incurred, the architect will examine any subsequently occurring adverse days to determine whether the contractor is entitled to a time extension. These subsequently occurring adverse weather days must prevent work for 50 percent or more of the contractor's work day and delay work critical to the timely completion of the project. The architect will convert ant delays meeting the above requirements to calendar days and use this as a guide in making decisions regarding request for delays and extension of time for inclement weather.
3. The contractor's schedule must reflect the above anticipated adverse weather delays on all weather dependent activities.

(b) *Filing of Claim* - **No such extension shall be made for delay occurring more than ten (10) days before claim therefore is made in writing to 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 therefore and not then unless such claim be reasonable.

(d) *Damages*. - [See also Article E-15] This article does not exclude the recovery of damages for delay by either party under other provisions in the contract documents.

-- [See also Articles E-1, E-3, E-14, E-26, E-46, and E-50]

NOTES:

1. Historical climatic conditions for the period during which work is to be performed must be considered by the Contractor before the proposal is submitted. Weather conditions shall be a cause for extension of time only if the historical conditions of rain, snow, or ice are exceeded for the period of the work and effect the Critical Path of Construction. Documentation of the presence of unusually severe weather, the extent to which the Contractor was then working, and how the abnormal weather condition had an adverse affect on the scheduled construction must be submitted with any notice request in applying for a time extension due to this cause.
2. No claims for extension of time will be considered when based on delays caused by conditions existing at the time bids were received, and of which the Contractor might be reasonably expected to have full knowledge at the time of bidding, or upon delays caused by failure on the part of the Contractor to anticipate properly the requirements of the work contracted for as to materials, labor and equipment. All claims for extension of time shall be made in writing to the Program Manager and/or Architect.
3. In the event Contractor is delayed at any time in the progress of the work, extension of time shall be the Contractor's **sole remedy** for any such delay (except for Contractor's right to terminate this Agreement pursuant to any application provisions of the Owner-Contractor Agreement), unless the same shall have been caused by acts constituting intentional interference by the Owner with Contractor's performance of the work and where and to the extent that such acts continue after the Contractor's notice to the Owner of such interference. **Written notice** of intentional interference by the Owner must be given within twenty-one (21) days of the occurrence or the claim is waived. The Owner's exercise of any of it's rights under any application provisions of the Owner-Contractor Agreement relating to Changes in the work, regardless of the extent of number of changes in the work, or requirement of correction or re-execution of any of the work, shall not under any circumstances be construed as intentional interference with the Contractor's performance of the work.
4. When the Contract time has been extended for causes as such extension of time shall not be considered as justifying extra compensation to the Contractor for administrative costs.

Article E-19. Correction of Work Prior to Contractor's Monthly Application for 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 the 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, performs 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 even physically commence the correction at the site early enough to complete within the space of time allowed in the order of condemnation. The owner will 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. 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.

NOTES:

Article E-20. Correction of Work after Final Payment. - 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 Architect 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, 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 materialman, 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. An additional security for the fulfillment of such obligations, 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 **TWO YEARS** from the date of the final certificate of the architect, and (2) that for not less than **TWO YEARS** 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 or 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, materialman, 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 principle, ratifies the warranties or guaranties 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, *Provide:* That the owner shall have furnished the contractor with a copy of notice to be served on the subcontractor, materialman, or manufacturer.
- (d) The contractor will bind his subcontractors, materialmen, and manufacturers to the terms of this article.

The calling for or the furnishing of written warranties or guaranties 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 Articles E-1(i), E-25, and E-60]

NOTES:

Article E-21. The Owner's Right to 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 make good such 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]

NOTES:

1. The Owner reserves the right to perform any work on the site, whether within or without the scope of this contract, necessary to correct any conditions which at the sole discretion of the Owner pose a hazard to the health or safety of pupils, teachers, administrators, or the general public. Such work will only be done on an emergency basis. If practical under the circumstances, the Contractor shall be given notice of any such conditions and given a reasonable opportunity to correct them. If work is done by the Owner pursuant to this subparagraph which is necessitated by any act or failure to act of the Contractor, the costs associated with such work shall be deducted from any sums due the Contractor and a written Change Order adjusting the contract sum will be issued.

Article E-22. Right of the Owner to Terminate Contract. - 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 terminate the contract, such notices to contain the reasons for such intention to terminate the contract, and unless within ten (10) 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 (10) 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 therefore [See Article E-15 for description of "force account"] [See also Article E-26]

NOTES:

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 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 to the contractor within fourteen days of its maturity and presentation any sum certified by the architect, then the contractor may, upon seven day's 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.

NOTES:

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 an application (sometime 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 program manager and/or architect and, if requested, supported by such evidence as to its correctness as the architect may direct. This schedule designated herein the "initial breakdown" (specimen of which will be supplied to any bidder), 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 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-41} 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]

NOTES:

1. The Form of the Application for Payment shall be Georgia State Department of Education Reimbursement Request Form DE 0263, July 1982, with AIA G703, Continuation Sheet, and latest edition.

REIMBURSEMENT REQUEST NO _____
(PROJECT NO. and (NAME)_____

CERTIFICATE OF THE CONTRACTOR OR HIS DULY AUTHORIZED REPRESENTATIVE

To the best of my knowledge and belief, I certify that all items, units, quantities and prices of work and material shown on this Reimbursement Request No. _____ are correct: that all work has been performed and materials supplied in full accordance with the terms and conditions of the contract documents between _____
(Owner)

and _____ dated _____

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

ORIGINAL CONTRACT AMT. \$ _____; ADJUSTED CONTRACT AMT. ---- \$ _____

- (a) Total amount earned for work in place (original contract) -----\$ _____
- (b) Total amount earned for work in place (change orders) ----- \$ _____
- (c) Value of materials stored on site ----- \$ _____
- (d) Total amount earned [(a) plus (b) plus (c)] ----- \$ _____
- (e) Amount retained (10%) ----- \$ _____
- (f) Total earned less retained percentage [(d) minus (e)] ----- \$ _____
- (g) Total previously approved ----- \$ _____
- (h) Amount due THIS REQUEST FOR CONTRACTOR [(f) minus (g)] -----\$ _____
- (l) Amount due THIS REQUEST FOR ARCHITECT -----\$ _____
- (j) TOTAL AMOUNT REQUESTED [(h) plus (l)] -----\$ _____

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

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

Contractor _____ By: _____

Date _____ Title _____

CERTIFICATE OF THE PROGRAM MANAGER

I certify that I have verified this Reimbursement Request and that to the best of my knowledge and belief it is a true and correct statement of work performed and materials supplied by the Contractor and that the Contractor's certified statement of his account and the amount due him is correct and just and that all work and material in this Reimbursement Request have been performed in full accordance with the terms and conditions of the contract documents and authorized thereto.

Name _____ Program Manager Inspector.
Date: _____

CERTIFICATE OF THE SUPERVISING ARCHITECT

I certify that I have verified this Reimbursement Request and that to the best of my knowledge and belief it is a true and correct statement of work performed and materials supplied by the Contractor and that the Contractor's certified statement of his account and the amount due him is correct and just and that all work and material in this Reimbursement Request have been performed in full accordance with the terms and conditions of the contract documents and authorized thereto.

Name _____ Supervising Architect.
Date: _____

RICHMOND COUNTY BOARD OF EDUCATION
 FACILITIES AND MAINTENANCE DEPARTMENT
 2956 MIKE PADGETT HWY
 AUGUSTA, GEORGIA 30906

WORK PERFORMED TO DATE

In support of Periodical Estimate for Partial Payment No. _____
 For the Period from _____ through _____ inclusive.
 Project No., Improvement No., School _____
 Contractor's Name and Address _____

WORK INCLUDED IN ORIGINAL CONTRACT

DETAILED ESTIMATE				WORK PERFORMED TO DATE			
Item Number	Number & Kind of Units	Unit Price	Estimated Cost	Number of Units	Amount Earned to Date	Value of Complete Work	Percent Complete
A. Total Amount of Original Contract							
B. Plus or Minus Total Previously Approved C.O.'s No. Inc.							
C. Plus or Minus C.O.'s include. approved during period covered by this estimate							
D. Total Net Adjusted Amount							

SCHEDULE OF CHANGE ORDERS

In support of Reimbursement Request No. _____

Project Name _____ Period Ending _____

Contractor _____

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

Article E-25. Certificates of Payments. - (a) *Issuance.* - If the contractor has made application for payment as provided under Article E-24, the architect shall not later than the date when each payment falls due 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, for 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 payments 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 for 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 time during construction, not 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]

NOTES:

Article E-26. Payments Withheld. - The program manager and/or 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 subcontractors 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 supply or update monthly critical path schedule or failure to maintain a rate of progress in accordance with the original construction critical path program schedule. [See also Articles E-1(i), E-25(c), and E-46]
- (g) - Failure to supply enough skilled workmen or proper materials. Failure to supply requested related contract documents, papers, forms, or to carry out contract procedures as outlined in plans and specifications or requested by Program Manager and/or Architect. [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 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 of acquiescence therein, and the owner may exercise its option from time to time and as often as may be expedient.

NOTES:

Article E-27. Insurance and Hazards. - (a) *Hazards.* - The contractor shall be responsible from the time of his signing the form of agreement or from the time of the beginning of the first work, whichever shall be earlier, for all injury or damage of any kind resulting from the work to persons or property regardless of who may be the owner of the property. [See also Article E-12] In addition to the liability imposed upon the contractor on account of bodily injury (including death) or property damage suffered through the contractor's negligence, which liability is not impaired or otherwise affected hereby, the contractor assumes the obligation to indemnify and hold harmless the Owner and Architect and their officers, agents, employees and representatives from and against any and all claims, damages, law suits, suits judgments, expenses, and costs, including attorney's fees, arising out of or resulting from bodily injury, sickness, disease or death, or to injury to or destruction of property including the loss of use or omission of the Contractor or any subcontractor or anyone directly or indirectly employed by them or anyone for whose acts any of them may be liable, regardless of whether or not such bodily injury, sickness, disease or death or injury to or destruction of property is caused in whole or in part by a party indemnified hereunder.

In any and all claims, demands, or judgments against the Owner or the Architect or any of their officers, agents, employees, or representatives by any employee of the contractor or any subcontractor, the indemnification obligation herein set forth shall not be limited in any way by a limitation on the amount or type of damages, compensation or benefit acts or other employee benefit acts, it being the intent of the parties that the indemnification therein given the owner and the architect shall be full and complete.

(b) *Insurance* - Proof of insurance coverage and furnishing of insurance policies shall be as shown herein below.

(1) *Compliance with Workmen's Compensation Laws.* - The contractor agrees to comply with the provisions of the workmen's compensation laws of the State of Georgia and to require all subcontractors likewise to comply. The contractor agrees that, prior to the beginning of the work by the contractor the contractor will furnish the following to the owner: Certificate from insurance company showing issuance of workmen's compensation coverage for the State of Georgia or a certificate from Georgia Workmen's Compensation Board showing proof of ability to pay compensation directly. The contractor agrees that the foregoing provision respecting workmen's compensation is also applicable to subcontractors.

(2) *Endorsement on Builder's Risk Policy.* - General Contractor shall purchase and maintain during the full course of construction "all-Risk" Builders Risk Insurance Coverage which names the Contractor, Owner, the Architect, and Engineers as co-insured. There shall be attached to and made part of the Insurance Policy for Builder's Risk an endorsement of the insurance company in accordance with the specimen shown below.

(3) *Endorsement of Casualty Policies.* - There shall be attached to and made a part of every CASUALTY INSURANCE POLICY an endorsement of the insurance company in accordance with the specimen shown below:

ENDORSEMENT -- BUILDER'S RISK

Attached to and forming part of Policy No. _____ of the

(Number of Policy)
_____ Insurance Company, issued at

(Name of Insurance Company)
its _____, _____ Agency. Date of Endorsement _____
(City) (State)

No. of (Improvement) (Project) Richmond County Board of Education, , 864 Broad Street, Augusta, Georgia 30901 In consideration of the premium for which the policy is written and proper rate adjustment when applicable, the insurance company agrees as follows:

- Item (1)* Furniture and equipment may be delivered to the insured premises and installed in place ready for use, and said delivery and installation of furniture and equipment shall in no way diminish, change, alter, or otherwise affect the coverage and protection afforded the insured under said policy.
- Item (2)* Occupancy shall in no way diminish, change, alter, or otherwise affect the coverage and protection afforded the insured under said policy. The insured shall give notice to insurance company of any occupancy or partial occupancy.
- Item (3)* The insurance company recognizes the right of the owner of the insured premises to perform other work in connection with construction operations insured under this policy and agrees that performance of other work by the said owner, by agents of the said owner, by the lessee of the owner, by contractors employed by the said owner, or by contractors employed by the lessee of the said owner shall in no way diminish, change, alter, or otherwise affect protection afforded under the said policy.
- Item (4)* This policy shall not be canceled, changed [which includes renewal], allowed to lapse or allowed to expire until ten days after the [see invitation to bid and insert name of owner], Richmond County Board of Education, 864 Broad Street, Augusta, Georgia, 30901, has received written notice thereof as evidenced by return receipt of registered letter. It is agreed that the said notice shall be valid only at to such improvements or projects as shall have been designated by number in said notice and that as to any improvement or project not designated by number in the said notice, coverage shall be continued in full force and effect.
- Item (5)* Any other provisions of the agreement to the contrary notwithstanding, coverage under this policy shall automatically terminate thirty-six months from the date shown below.

The foregoing insurance provisions have been incorporated into by reference and are hereby made a part of insurance policy No. _____, this _____ day of _____, 19 _____

(Name of Company)

(Signature of Authorized Representative)

(3) Endorsement of Casualty Policies: There shall be attached to and made part of every Casualty Insurance Policy and Endorsement of the insurance company in accordance with the specimen shown below:

SPECIMEN
ENDORSEMENT -- CASUALTY

Attached to and forming a part of Policy No. _____ of the

(Number of Policy)
_____ Insurance Company, issued at
(Name of Insurance Company)
its _____, _____ Agency. Date of Endorsement _____
(City) (State)
No. of (Improvement) (Project) _____ .

In consideration of the premium for which the policy is written and proper rate adjustment when applicable, the insurance company agrees as follows:

Item (1) This policy shall not be canceled, changed (which includes renewal), allowed to lapse, or allowed to expire until ten days after the (see invitation to bid and insert name of owner), Richmond County Board of Education, 864 Broad Street, Augusta, Georgia 30901, has received written notice thereof as evidenced by return receipt of registered letter or until such time as other valid and effective insurance coverage acceptable in every respect to the owner and providing equal protection called for in the policy shown below shall have been received, accepted, and acknowledged by the owner. It is also agreed that the said notice shall be valid only as to such improvements or projects as shall have been designated by number in said notice and that as to any improvement or project not designated by number in the said notice, coverage shall be continued in full force and effect.

Item (2) Any other provisions of the agreement to the contrary notwithstanding, coverage under this policy shall automatically terminate thirty-six months from the date shown below.

The foregoing insurance provisions have been incorporated into by reference and are hereby made a part of insurance policy No. _____, this _____ day of _____, 19 _____

(Name of Company)

(Signature of Authorized Representative)

(4) *Ratification of Agent's Endorsement.* - In furnishing the insurance policy or in furnishing proof of coverage, as the case may be, the casualty insurance carrier shall upon request submit evidence satisfactory to the owner that the agent of the carrier who executed an endorsement had the authority to make changes in the terms of the insurance policy which are binding on the insurance company.

(5) *Policies, Certificates, Limits and Disposition of Documents.* - The contractor shall obtain at his expense insurance with limits as shown hereinbelow unless the contractor desires to broaden the limits and obtain more protection.

- [1] OWNER'S PROTECTIVE LIABILITY INSURANCE -- Taken out in name of the owner as insured. [See Invitation to Bid for exact legal name of owner.]
Bodily injury, including death - limits of \$300,000.00 for each person and \$500,000.00 for each accident.
Property damage - limits of \$100,000.00 for each accident and \$300,000.00 for the aggregate of operations.
DISPOSITION: Original policy must be deposited with owner prior to commencement of work.

- [2] CONTRACTOR'S PROTECTIVE LIABILITY INSURANCE - Taken out in the name of the contractor.
Bodily injury, including death - limits of \$300,000.00 for each person and \$500,000.00 for each accident.
Property damage - limits of \$100,000.00 for each accident and \$300,000.00 for the aggregate of operations.
DISPOSITION: Certificate of insurance must be sent to owner prior to commencement of work.

- [3] CONTRACTOR'S PUBLIC LIABILITY INSURANCE - Taken out in the name of the contractor.
Bodily injury, including death - limits of \$300,000.00 for each person and \$500,000.00 for each accident.
Property damage - limits of \$100,000.00 for each accident and \$300,000.00 for the aggregate of operations.
DISPOSITION: Certificate of insurance must be sent to owner prior to commencement of work.

- [4] BUILDER'S RISK INSURANCE - Payable to the contractor and owner, as their interests may appear, upon the entire structure and upon all materials in or adjacent thereto which are to be made a part of the insured structure to 100% of the insurable value thereof covering fire, extended coverage, vandalism and malicious mischief.
DISPOSITION: Original policy must be deposited with owner prior to commencement of work.

(6) *Acceptability of Insurers to Owner.* - No insurance will be acceptable unless written by a company licensed by the State Insurance Commissioner to do business in Georgia at the time the policy is issued, and the company must in addition be acceptable to the owner. To avoid inconvenience, any general contractor or subcontractor must get in touch with the owner to determine whether the insurance companies he expects to use is or are acceptable to the owner. All policies and certificates must be signed or countersigned, as the case may be, by resident Georgia agents.

(c) *Termination of Obligation to Insure.* - Unless otherwise expressly provided to the contrary, the obligation to insure as prescribed herein shall not terminate until the architect shall have executed the final certificate. [See also Articles E-20, E-24, E-29, and E-71 of general conditions and Article 5 of Form of Agreement between Contractor and Owner].

(d) *Competence of Insurers.* - The Contractor is responsible for any delay resulting from the failure (1) of his insurance carriers and (2) of insurance carriers of his subcontractors to furnish proof of proper coverage in (1) the prescribed form, (2) the prescribed manner, and (3) in good season.

NOTES:

1. The Contractor shall furnish six (6) copies of certificate of insurance which shall specifically set forth evidence of all coverage required. The form of the certificate shall be AIA Document G705 or the Accord Form. The Contractor shall furnish copies of any endorsements that are subsequently issued amending coverage or limits. This policy is to include the clause, "The policies herein referenced to are not cancelable or subject to change of coverage by the insurer unless Hanscomb/GMK has received ten (10) days written notice as evidenced by return receipt of registered or certified letter."
2. Property insurance on the entire project to cover risks of direct physical loss subject to policy conditions and exclusions ("all-risks coverage") to the full insurable value therefore shall be carried by the Contractor, and a certificate of compliance shall be furnished through the Program Manager. This insurance shall have a \$1000 "deductible" on any insured loss and that the amount of this deductible and any other losses not specifically covered under the Owner's policy shall be borne by the General Contractor and/or his subcontractors. Specifically that the insurance does not cover any loss from theft or burglary, nor does it cover loss of any tools, equipment, scaffolding, staging, towers, forms, machinery, etc. owned or rented by the prime contractors, or subcontractors which are not intended to become a part of the project; but does cover damage to the building of contents because of theft or burglary
3. The General Contractor and/or his subcontractors must report any loss to the Owner (who in turn will notify the Insurance Agency as soon as the loss occurs in order that damage be assessed before job conditions are disturbed. Formal claims against this policy should be submitted within 14 days after occurrence.

Article E-28. Affidavits. - Before receiving retainage [See also E-24 and E-32] the contractor will be required to furnish non-influence affidavit and statutory affidavit in the exact form as shown hereinbelow:

SPECIMEN

NON-INFLUENCE AFFIDAVIT

COUNTY OF _____

STATE OF _____

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

between _____ and the [insert name of 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 [insert name of owner], or any person connected with the State Government of Georgia in any way whatsoever.

This _____ day of _____, 20 _____.

Signature (L.S.)

Title

Firm

COUNTY OF _____

STATE OF _____

Personally before me, the undersigned authority, appeared _____,
who is known to me to be an official of the firm of _____, who,
after being duly sworn, stated on his oath that he had read the above statement and that the same is true
and correct.

Notary Public

My commission expires _____

This _____ day of _____, 20 _____

LIEN RELEASE FORM

COUNTY OF _____
STATE OF _____
FROM _____

(Contractor)

To: [insert name of owner], Owner
Contract entered into the _____ day of _____, 20 _____, between
the above-mentioned parties for the construction of a _____
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 of by virtue of the contract.

This _____ day of _____, 20 _____

Signature

Title

Firm

COUNTY OF _____
STATE OF _____

Personally before me, the undersigned authority, appeared _____,
who is known to me to be an official of the firm of _____, who,
after being duly sworn, stated on his oath that he had read the above statement and that the same is true
and correct.

Notary Public

My commission expires

This _____ day of _____, 20 _____

Article E-29. - Omitted

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 hereinbelow. 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. [NOTE: To avoid inconvenience, the contractor should get in touch with the owner to determine whether the surety he expects to use is acceptable to the owner.]

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That _____
(Legal title and address of the Contractor)

as Principal (hereinafter referred to as "Contractor"), and _____
(Legal title and address of Surety)

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

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 bounded Principal has entered into a contract with Owner bearing date of _____ for _____
(Here insert name of work)

in accordance with drawings and specifications prepared by _____
(Here insert full name and title)

which said contract is incorporated herein by reference and made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Contractor shall promptly and faithfully perform and comply with the terms and conditions of said contract; and shall indemnify and save harmless the Owner against and from all costs, 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 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 of drawings.

2. If pursuant to the contract documents the Contractor shall be declared in default by the Owner under the aforesaid Contract, the Surety shall promptly remedy the default or defaults or shall 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 of 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 solvency of 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, the Surety shall, within 30 days of receipt of such notice, cause to be paid any unpaid amount for such labor or 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 subcontractors, laborers, materialmen, or other parties concerning the status of payments for labor, materials, or services furnished in the prosecution of the work.

5. The Surety agrees that other than as is provided in this bond it may not demand of the Owner that the Owner shall (a) perform any thing or act, (b) give any notice, (c) furnish any clerical assistance, (d) render any service, (e) furnish any paper or documents, or (f) take any other action of any nature or description which is not required of the Owner named herein or the legal successors of the Owner.

Signed and sealed this _____ day of _____ A.D. 20 _____
IN THE PRESENCE OF:

	_____ (Principal) (SEAL)
	_____ (Title)
	_____ (Surety) (SEAL)
	_____ (Title)

PAYMENT BOND

THIS BOND IS EXECUTED TOGETHER WITH ANOTHER BOND IN FAVOR OF THE OWNER AS OBLIGEE CONDITIONED UPON PERFORMANCE OF THE CONTRACT
KNOW ALL MEN BY THESE PRESENTS:

That _____
(Legal title and address of the Contractor)

_____ as Principal (hereinafter referred to a "Principal"), and _____
(Legal title and address of Surety)

_____ as Surety (hereinafter referred to as "Surety"), are held and firmly bound unto _____

_____ as Obligee (hereinafter referred to as "Owner"), for the use and benefit of claimants defined, hereinafter, in the

amount of _____
(Insert contract price)

Dollars \$ _____), to which payment Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above bounded Principal has entered into a contract with Owner dated _____
for _____
(Insert here name of work)

in accordance with drawings and specifications prepared by _____
(Insert here 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 a 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, extensions of time or extensions of time, alteration or alterations or addition or additions to the term of the contract affect its obligation on the 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 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 such claim is made, or when he has completed his subcontract for which claim is made, shall have the right to sue on such payment bond for the amount, or the balance thereof, unpaid at the time of the commencement of such action and to prosecute such action to final execution and judgment for the sum or sums due him; provided, however, that any person having direct contractual relationship with a subcontractor, but no contractual relationship express or implied with the contractor furnishing said payment bond, shall have the right of action upon the said payment bond upon giving written notice to said contractor within ninety days from the day on which such person did or performed the last of the labor, or furnished the last of the materials or machinery or equipment for which such claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished or supplied or for whom the labor was performed or done; provide further that nothing contained herein shall limit the right of action to said 90-day period. Notice may be served by depositing a notice, registered mail, postage prepaid, duly addressed to the contractor at 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 the Owner being made a party thereto. The official who has the custody of said bond is authorized and directed to furnish, to any person making application therefore who submits an affidavit that he has supplied labor or materials for such work and payment therefore has been made, or that he is being sued on any such bond, a copy of such bond and the contract for which it is given, certified by the official who has custody of said bond, this copy shall be primary evidence of said bond and contract and shall be admitted in evidence without further proof. Applicants shall pay for such certified copies and such certified statements such fees as the official fixes to cover the cost of preparation thereof, but in no case shall the fee exceed the fees 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 considered the same as a bond furnished under Section 23-1705 *et seq.*, of the Code of Georgia, as amended, and all provisions of law pertaining to bonds furnished under said Section shall pertain hereto.

Signed and sealed this _____ day of _____ A.D. 20 _____

IN PRESENCE OF:

(SEAL)

(Principal)

(Title)

(SEAL)

(Surety)

(Title)

NOTES:

Article E-31. *Omitted.*

NOTES:

Article E-32. Liens. - Neither the final payment nor any part of the retained percentage shall become due until the contractor 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 [Se also Articles E-24, E-25, and E-28]

NOTES:

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 to become due to him hereunder.

NOTES:

Article E-34. Mutual Responsibility of Contractors. - Should the contractor cause damage to any separate contractor on the work the contractor agrees, upon 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. [See also Article E-35]

NOTES:

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 and acceptance of the other contractor's work as fit a 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 insure 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] --

NOTES:

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...

(a) What trades and portions of the work are to be performed under subcontract, and

(b) 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.). **Contractor will also provide a list of subcontractors, noting their business trade, estimated value of their work and business classification (MBE/WBE) for the Local Participation Report to the Board.**

(c) *No approval of subcontractors.* - Neither the owner nor the architect undertakes to pass upon, or approve any subcontractor.

(d) *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.

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

(f) *Contractor responsible for acts and omissions of subcontractors, materialmen, suppliers, and employers.* - The contractor agrees that he is a 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 work and for compliance with all requirements of the contract documents. The contractor may 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 R-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)]

(g) *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 or the contractor or his subcontractors. [See also Articles E-2, E-37, E-45, and E-60]

NOTES:

Article E-37. Relationship of Contractor and Subcontractors.- a) *Obligations of Each.*-The contractor agrees to bind 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-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 claims for extra expense is one week.

THE CONTRACTOR AGREES

- (4) To be bound to the subcontractor by all the obligations that the owner assumes to the contractor under the contract documents.
- (5) 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.
- (6) 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.
- (7) 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.

- (8) 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.
 - (9) To pay the subcontractor a just share of any fire insurance money received by the contractor.
 - (10) 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.
 - (l 1) 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.
 - (12) 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(l), 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]

NOTES:

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 insure 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 be that of the former architect.

NOTES:

Article E-39. Architect's Decisions. - (a) *Promptness.* - The architect shall make decisions with reasonable promptness after presentation of evidence on (1) 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 of 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 until ten days after receipt of 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. [See also Articles E-3, E-15, and E-16] Architect will reimburse Owner for any damage claim due contractor.

NOTES:

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 the 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]

NOTES

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 for the [show name of improvement or project as it appears in the form of agreement] having been fully completed except as stipulated hereinbelow, 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 intransferrable 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, and E-467] 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.

NOTES:

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]

NOTES:

1. Smoking is prohibited except in designated area.

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]

NOTES:

1. All Contractors, subcontractors and material suppliers will be responsible for inspecting all job conditions affecting the installation of an item and taking all field measurements required prior to fabrication of an item to insure that the item concerned will integrate properly with all adjacent materials and fit all other conditions as they exist or will exist in the finished construction. Work in connection with installation of an item will be coordinated with all other affected work and trades. Sleeves, anchors, and other items that must be embodied in or that otherwise affect other portions of the work will be located and set while such portions of the work are in progress.

Each Contractor is responsible for inspecting the work which precedes his work and reporting any deficiencies which will affect his work to the Architect/Program Manager prior to beginning new work. Should a Contractor be required to perform work or apply finished materials, he shall inspect the surfaces or work to receive his materials for any defects, alignment or conditions that may prevent his work from meeting or exceeding the requirements of the Contract Documents. Should the Contractor find by inspection that the surfaces of work are not acceptable to receive his work, he shall notify the Program Manager in writing of the conditions. Should the Contractor fail to inspect the work or advise the Program Manager and or/Architect, the Contractor then will be held responsible for the resulting damage. Once new work has begun over preceding work, the Architect/Program Manager will note this as the new Contractor's acceptance of all preceding work.

Article E-44. Cleaning Up. - The contractor shall at all times keep the premises free from accumulations of waste materials 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 disputes 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]

NOTES:

1. General temporary facilities which affect all Contractors are outlined below. Refer to Division I-Section II-Scope of Work for other specific temporary services assigned to each particular Scope of Work.

The Contractor will provide a job telephone for his, the Architect's and the Owner's use for the duration of the project. Each Contractor will provide, or arrange for the use of, a telephone for his own use while on the project.

Each Contractor will provide his own drinking water.

Each Contractor will provide his own storage and office trailers that he deems necessary to carry out his work. All Utilities for Contractor's storage and office trailers, including utility consumption will be the responsibility of each individual Contractor.

The Contractor will provide and maintain lines, batters and permanent reference points. Each Contractor is responsible for and will provide his own layout and will coordinate his layout with the other Contractors.

The Contractor will broom sweep the building, once a week or more often as required by job conditions and remove trash from building site once per week or as often as needed. The Contractor will assume this responsibility as soon as the roof deck is installed, or demolition has been completed in each portion of the building area.

Each Contractor will not allow trash to accumulate and will remove same from work areas at the close of each day. All debris will be disposed of off campus on a weekly basis. Burning of materials on site will not be permitted.

The Contractor will be responsible for the final clean up of the job for the purpose of readying the project for final Architectural review and Owner Occupancy.

Each Contractor will remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from interior and exterior surfaces of fixtures, hardware, finish surfaces or equipment furnished as part of his Contract prior to final inspection.

The Contractor will be responsible for operating and maintaining the permanent heating/cooling systems as the Schedule requires for the installation of finishes.

Contractor will replace all air conditioning filters with new filters just prior to Owner's occupancy of the building. This is NOT the filters used for operation during finishes and it is NOT the attic stock filters required for turn-over.

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 Articles E-03, E-2, E-36, and E-37]

NOTES:

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 proposal 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 not 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 the covenant as to time") shall not relieve the contractor from liability for breach of the 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]

NOTES:

Article E-47. Alternates. - (1) Deductive alternates may be used to reduce the base bid; if used, deductive alternates will be prioritized and exercised in numerical sequence as used in the bid documents.

(2) Additive alternates may be used; if used they may be exercised in any order.

(3) The Project shall be awarded by the base bid less any deductive alternate selected (if any); plus any Additive alternates selected (if any). To be clear, any deductive alternates and/or additive alternates selected will be used to determine the low bid.. [See also Article C-04(d)]

NOTES:

Article E-48. CONTRACT CLOSE-OUT

Comply with requirements stated in Conditions of the Contract.

No provisions of this Section shall in any way relieve the Contractor of completing his work on time.

PROJECT TERMINATION:

Contract requirements shall be met with construction activities have successfully produced, in this order, these three terminal activities:

Substantial Completion
Final Completion
Final Payment

PRELIMINARY INSPECTION:

When the Contractor determines that his work or portions of his work are sufficiently near substantial completion to warrant a preliminary inspection, he shall request in writing to the Architect/Program Manager a preliminary inspection.

At a mutually agreeable time the Architect and/or Program Manager and Contractor shall conduct a preliminary inspection of the work for completeness and conformance to the Contract Documents. A preliminary punch list of incomplete or non-conformance work shall be made by the Contractor and Program Manager and/or Architect.

The Program Manager and/or Architect shall establish a reasonable time period for the completion or correction of all items on the preliminary punch list. Completion or correction of the preliminary punch list will be prerequisite to Architectural observation for Substantial Completion.

SUBSTANTIAL COMPLETION:

The Date of Substantial Completion of the work or designated portion thereof is the date certified by the Architect when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner may occupy the work or designated portion thereof for the use for which it is intended.

When Contractor considers that the work, or designated portion thereof is substantially complete, and he has completed correction of the items on the preliminary punch list, the Contractor will submit a written notice to the Program Manager and/or Architect stating that the work, or designated portion thereof, is substantially complete and that the Contractor requests inspection of the work.

In addition to the written notice requesting inspection, the Contractor shall prepare for the Program Manager and/or Architect a list of items which remain incomplete or not corrected. The Contractor's List will include a reason why the item of work is incomplete or not corrected and will give a date when the work will be completed or corrected.

The Program Manager shall review the Contractor's request and list, consult with the Architect and submit request for Substantial Completion Observation at a mutually agreeable date.

Within a reasonable time after receipt of such notice, Architect, Program Manager and at his option, the Owner, will make an observation to determine the status of completion.

Should Architect determine that the work is not substantially complete:

Architect will promptly notify the Program Manager in writing, giving the reasons for the work not being substantially complete.

Program Manager shall forward notice to the Contractor.

Contractor shall remedy the deficiencies in the work, and send a second written notice of substantial completion to the Architect, who will forward the notice to the Program Manager.

Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to the Architect that the work is complete. Architect, if in agreement shall forward to the Program Manager.

When Architect concurs that the work is substantially complete, he will:

Prepare a Certificate of Substantial Completion on AIA Form G704, accompanied by Architect's Punch List of items to be completed or corrected, as verified and amended by the Program Manager.

(Note: Contract responsibilities are not altered by inclusion or omission of required work from the Punch List)

Submit the Certificate to Owner and Program Manager for their written acceptance of the responsibilities assigned to them in the Certificate.

Contractor shall complete or correct all items identified on the Punch List and required by the Contract requirements within time limits established by the Certificate of Substantial Completion.

FINAL COMPLETION:

To attain Final SUBSTANTIAL COMPLETION, The Contractor shall complete activities pertaining to Substantial Completion, and complete work on the Punch List. Only then shall he issue written request to the Program Manager and Architect for Final Observation.

When Contractor considers the work is complete, he shall submit written certification to Program Manager and Architect that:

Contract Documents have been reviewed.

Work has been inspected for compliance with Contract Documents.

Work has been completed in accordance with Contract Documents.

Equipment and systems have been tested in the presence of the Owner's representative and are operational.

Work is completed and ready for final observation.

Architect, Program Manager, Contractor and Owner will make an observation to verify the status of completion with reasonable promptness after receipt of such certification.

Should Architect consider that the work is incomplete or defective:

Architect will promptly notify the Program Manager in writing, listing the incomplete or defective work. Program Manager will notify Contractor.

Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to Program Manager that the work is complete. Program Manager, if in agreement shall forward to the Architect.

Architect will re-inspect the work.

When the Architect finds that the work is acceptable under the Contract Documents, he shall request the Contractor to make close-out submittals.

CONTRACTOR'S CLOSE-OUT SUBMITTALS TO ARCHITECT AND/OR PROGRAM MANAGER (See Section G for additional details and requirements):

Evidence of Payment and Release of liens:

Assurance that unsettled claims will be settled including;

Submission of AIA Document G706, Contractor's Affidavit of Debts and Claims
Submission of AIA Document G707, Consent of Surety Company to Final Payment
Submission of AIA Document G706A, Contractor's Affidavit of Release of Liens from:
Contractor
Subcontractor
Materials Suppliers:

Evidence of compliance with requirements of governing authorities:

Certificate of Occupancy
Certificate of Inspection

Contractor's Written Guarantee on Company letterhead

Project Record Document:

Operating and Maintenance Data, Instructions to Owner's Personnel.

Warranties and Bonds: To requirements of individual sections

Spare Parts and Maintenance Materials: To requirements of individual sections

Clean-up Letter on company letterhead stating project clean-up has been completed and that Contractor has removed all temporary facilities.

Asbestos Letter on company letterhead stating no asbestos containing materials have been installed on the project.

Surveyor's Drawings-

As-Built Drawings to include a CD of the complete drawings, including GPS coordinates for utilities as required by Augusta/Richmond county Utilities and Inspection Department for occupancy.

Certificate of Substantial Completion

Letter from Contractor stating that he has instructed Owner's personnel on use of equipment (E-55)

Test and Balance Reports (Mechanical)

Certificate of Manufacturer for major components (E-67)

List of Subcontractors by Specialty, including address and telephone numbers for warrantee calls

Termite Letter (Bond)

Low Voltage Systems Certification

Statutory Affidavit as included in the Project manual

Non-Influence Affidavit as included in the Project Manual.

NO FINAL APPLICATIONS FOR PAYMENT WILL BE PROCESSED FOR PAYMENT UNTIL FINAL INSPECTION AND FINAL ACCEPTANCE BY THE ARCHITECT, PROGRAM MANAGER AND OWNER.

FINAL ADJUSTMENT OF ACCOUNTS:

Submit a final statement of accepting to Program Manager

Statement shall reflect all adjustment to the Contract Sum:

The original Contract Sum

Additions and Deductions resulting from

Previous Change Orders

Unit Prices

Deductions for uncorrected work

Deductions for re-inspection payments

Other payments

TOTAL CONTRACT SUM as adjusted.

Previous payment

Sum Remaining Due

Program Manager will prepare a final Change Order, reflecting adjustments to the Contract Sum which were not previously made by Change Orders.

FINAL APPLICATION FOR PAYMENT:

Contract shall forward the final Application for Payment to the Architect. The Architect will evaluate the Application and forward to the Program Manager with recommendations in accordance with procedures and requirements stated in the Conditions of the Contract.

Submission of AIA Document G706-Release Liens, AIA Documents G707- Consent of Surety and AIA Document G706 Affidavit of Payment of Debts and Claims are required before the Program Manager will evaluate any final Application for Payment

In the event that the Contractor submits final Application for Payment with the aforementioned required AIA Documents, refer to Section G regarding withholdings. This amount does not include any amount held for change orders pending, back charges, project deficiencies or punch list items.

NOTES:

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 contract, plans and specifications shall be reported to the Architect for his decision. 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

NOTES:

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, cash flow schedule showing cash flow projected monthly from job beginning to completion, 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 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 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]

NOTES:

1. All Contractors will be required to submit weekly Construction Reports by 10:00am Friday to the Program Manager. The report will include the number of men by trade or craft, type and location of

work. It will include Contractors and other information as required by the Program Manager. Each Contractor will use the Program Manager's form.

The Program Manager, on behalf of the Owner, will arrange for, duly notify all affected contractors, establish an agenda, and conduct monthly job meetings during the course of the contract. Each Contractor will be represented at every meeting by a responsible member of his organization.

Article E-51. Office for Program Manager. – The program manager will utilize the contractor's jobsite trailer/office for the purposes of holding meetings and reviewing documents. The contractor shall provide a jobsite office that is adequate to house the required project record documents and to have OAC meetings.

NOTES:

Article E-52. Trading with the State Statute. - In submitting a proposal, the bidder certifies that the provision of the act entitled "State Employees and Officials - Trading with the State", Georgia Laws 1956, pp. 60 *et seq.*, has been complied with.

NOTES:

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. [See also Articles E-5, E-43, E-55, and E-67]

NOTES:

Article E-54. Keys. - Keys with tags indicating number and/or description of door or room each key is intended to fit attached to each key, shall be delivered to the owner. Contractor will forward keys to owner with a letter to Architect indicating that the keys given to Owner and person's name accepting keys. Master keys will be hand delivered to Director of Maintenance of Richmond County School District. Contractor shall prepare and furnish with the keys itemized key schedule in quintuplicate listing the door or room number and/or description, serial number or key and number of keys being delivered for each door or lock.

NOTES:

Article E-55. Operation and Maintenance Data and Instructions. - 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. Equipment, kitchen equipment, fire alarm & life safety systems, intercom, and time clock systems. 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 commence. The aforesaid notice shall not (repeat NOT) be given to the lessee of the owner. 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 or operation and maintenance. [See also Articles E-53, E-62, and E-67]

Section G of the Specifications provides detailed requirements for O&M and Close-out documentation requirements.

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]

NOTES:

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.

NOTES:

1. RELATED DOCUMENTS:
Drawing and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section

SUMMARY:

This section specifies administrative and procedural requirements governing handling and processing allowances. Selected materials and equipment, and in some cases, their installation are shown and specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. Additional requirements if necessary will be issued by Change Order.

Types of allowances required include the following:

- General allowances
- Material allowances
- Unit Cost allowances

Use of allowances for inspection and testing agencies is included in Section "Testing laboratory Services"

Allowance funds will not be used for any work indicated in the Contract Documents to be part of the Base Bid Contract.

When changes in the contract sum (increase or decrease) are based on Allowances, no overhead or profit shall be allowed and allowances are Net.

2. **SUBMITTALS**

For General Allowances, when directed by the Program Manager, submit proposals for work done under the General Allowances. Submit written information a follows:

State proposed amount to be charged against the allowance

Include full backup data such as cost estimates, material breakdowns, subcontractor's letter or proposal or similar information.

Submit this General Allowance Proposal in a single copy to the Program Manager.

For Materials Allowances, submit invoices or delivery slips to indicate actual quantities and cost of materials delivered to the site for use in fulfillment of each materials allowance. Such invoices must be transmitted and approved by the Program Manager prior to billing the applicable invoices against the Materials Allowance amount.

For test Allowances, submit invoices from testing laboratory or from applicable consultant to indicate actual test and inspections performed for use in fulfillment of each testing allowance. Such invoices must be transmitted and approved by the Program Manager prior to billing the applicable invoices against the Testing Allowance amount.

GENERAL ALLOWANCES

Use the general allowances only as directed for the Owner's purposes, and only by Field Directives issued by the Program Manager which designate amounts to be charged to the allowance. Such work must be approved by the Program Manager and a Field Directives will be issued prior to implementation.

Field Directives authorizing use of funds from general allowances will include the Contractor's related costs. No overhead and profit margins will be allowed as allowances are net.

At project close-out, credit unused amounts remaining in the General Allowance to Owner by Change Order.

MATERIALS ALLOWANCES

Material allowances will include costs of all materials and applicable sales tax

All labor to install materials purchased under allowance shall be included under Base Bid, and shall not be part of the materials allowance

At the earliest feasible date after Contract award, advise the Architect of the date when the final selection and purchase of each product or system described by an allowance must be completed in order to avoid delay in performance of the Work.

When requested by the Program Manager and/or Architect obtain proposals for each allowance for use in making final selections; include recommendations that are relevant to performance of the Work.

Purchase products and systems as selected by the Architect from the designated supplier

UNIT COST ALLOWANCES

Perform work based on unit-cost allowances only as directed by Field Directives issued by the Architect which designate amounts to be charged to the allowance. Such work must be approved by the Program Manager and a Field Directives will be issued prior to implementation.

Field Directives authorizing use of funds from the unit-cost allowances will include the Contractor's related costs. No overhead and profit margins will be allowed as allowances are net.

At Project close-out, credit unused amounts remaining in the unit-cost allowances to Owner by Change Order.

Article E-58. Testing Services. - Laboratories for testing services shall be selected by, engaged by, and responsible to the Owner, *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 coordinate directly with the selected testing agency to schedule testing as required/needed, and provide notification to the architect stating the date and the hour when he will be ready for the test.** Should reinspection's be required by failure of the work to be ready or by failure of the work to meet specifications, 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. Drilling Samples and Log of Drilling Wells. - In the event the work includes a drilled well, the contractor shall forward drilling samples to "Ground Water Division: State Department of Mines, Mining, and Geology; 19 Hunter Street; Agriculture Building; Atlanta, Georgia 30303". Notice by contractor (NOT BY SUBCONTRACTOR) concerning shipment must be forwarded to the Ground Water Division setting forth the name and number of the job, and a copy of the notice must be furnished to the resident engineer inspector, architect, and owner. Samples shall be placed in glass jars of one pint size. The jar shall be tightly covered and shall be labeled in ink to show the date and depth at which the samples were taken and the number of the job. At every change of formation the depth and date at which the change occurred and any unusual circumstances during the completion of the work. Satisfactory evidence that samples have

been delivered to the Ground Water Division and receipt of the log book shall be conditions precedent to certification of the work for payment.

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 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 Article E-9, E-13, E-14, E-15, E-20, E-36, E-37, E-38, and E-39]

NOTES:

Article E-61. Staples Prohibited on Pipe and Ductwork Insulation. - No staples shall be used in the application of any type of insulation on any time of pipe or in the application of any type of insulation or any type of ductwork.

NOTES:

Article E-62. Mechanical Systems, Retainage Pending Balance of. - If the work includes a heating system, there shall be withheld from the retainage of the contractor as an exception under Article 5(d) of the form of agreement [work which is incomplete through no fault on the part of the contractor] one-half of one per cent of the amount shown on the breakdown of the contractor for the heating system until such time as the architect shall have certified that the heating system has been balanced under seasonal weather conditions, *Provided:* That the amount withheld shall in no event be less than \$1,000.00; and if the work includes an air conditioning system, the same provision shall apply to the said air conditioning system. [See also Article E-71 for specimen of form of agreement]

NOTES:

Article E-63. Hot Water Heaters. - No plastic dip tubes may be installed in any hot water heater. The dip tube or filler tube for any hot water heater shall be of galvanized steel, brass, copper, or stainless steel pipe. Temperature relief valves or combined temperature and pressure relief valves for any hot water heaters shall be of such design that the water in the hot water tank will not exceed 210 degrees Fahrenheit maximum. Temperature relief valves or combined temperature and pressure relief valves for any hot water heaters shall be set at a pressure not exceeding the rated working pressure of the hot water tank or heater, but in no case in excess of 150 pounds per square inch. If the architect shall have designed work not in compliance with this article, there shall be a change order with an adjustment in the contract as provided in the contract for changes in the work

NOTES:

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 contract documents 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.

NOTES:

Article E-65. Concrete Specifications. - "Standard Minimum Concrete Specifications", October 1963, adopted jointly by Georgia Branch, the Associated General Contractors of America, and 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, the higher quality of materials, may be obtained from Georgia Branch, Associated General Contractors of America, 163 Harris Street, N.W., Atlanta, Georgia, without cost. [See also Article E-58]

NOTES:

Article E-66. House Bill No. 210. - House Bill No. 210 [Act No. 443] of the General Assembly of Georgia having been signed into law on April 12, 1963, the same is hereby incorporated into the general conditions of the contract as follows:

SECTION 1

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 contractor or subcontractor shall use exclusively Georgia forest products in construction thereof, when forest products are to be used in such construction, addition of repair, and if Georgia forest products are available.

SECTION 2

The provisions of this Act shall not apply when in conflict with Federal rules and regulations concerning construction.

NOTES:

Article E-67. Certificates of Manufacturers for Major Components. - For elevators, moving walks, dumb-waiters, escalators, lifts, major components of air conditioning systems [*i.e.*, cooling towers, compressors, condensers, absorption units, chiller units, fan coil units, air handling units, boilers, base mounted pumps, and temperature controls]; major components of heating systems [*i.e.*, boilers, base mounted pumps, air handling units, unit ventilators, fan coil units, temperature controls, and boiler chemical feed systems]; major components of plumbing systems [*i.e.*, boilers, base mounted pumps, sewage pumps and water treatment systems]; and incinerator systems; start-up, testing, and placing into operation shall be performed by the field representative(s) of the manufacturer(s) in which 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 attached hereto] 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 manufacturer's ties in and functions together require the field representative 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) *Attachment to Article E-67: Form No. 290 (less enclosure thereto) - Specimen Certificate of Manufacturer.*

NOTES:

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-33 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. If the contractor has met his obligations as outlined hereinbefore, it would hardly be possible for more than one day of the time of the representative of the manufacturer to be required.

Date: _____

Richmond County Board of Education
864 Broad Street
Augusta, Georgia 30901

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 IMPROVEMENT OR 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 _____, 19 _____

JOE DOE CORPORATION

By _____
Authorized Representative

(*) The date *must* be shown

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

DEFINITIONS:

1. "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.

Article E-68. *Omitted.*

NOTES:

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 hereinbelow:

Richmond County Board of Education
864 Broad Street
Augusta, Georgia 30901

-- [See also Articles E-1(d), E-3, E-15, E-16, E-18, and E-39(c)] --

NOTES:

Article E-70. Utilities. - Pending the extension and connection of permanent water and permanent electric power, the contractor shall obtain temporary electric power at his own expense. **In the absence of provisions to the contrary, the contractor shall pay for all utilities services until the final acceptance by Architect and/or Owner has been executed or until the work is occupied, whichever is the earlier.** [See also Article E-9] If building is phased and portions of the building are occupied by Owner prior to final acceptance of entire structure, the cost of utilities for the occupied portion of the building will be pro-rated based upon the square footage of the building occupied by the Owner.

NOTES:

Article E-71 Form of Agreement. - The form of agreement shall be executed on Form No. 418, specimen of which is attached hereto. [See also Article E-1]

Attachment to Article E-71: Form No. 418, "FORM OF AGREEMENT BETWEEN CONTRACTOR AND OWNER"

NOTES:

FORM OF AGREEMENT BETWEEN CONTRACTOR AND OWNER

THIS AGREEMENT made the _____ day of _____ in the year Twenty
Hundred and _____ by and between _____

hereinafter called the Contractor, and _____

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 _____

_____ prepared by _____ 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 or the drawings.

2. TIME OF COMPLETION. - The work to be performed under this contract shall be commenced _____ and shall be completed _____

3. THE CONTRACT SUM - The owner shall pay the contractor for the performance of the contract, subject to additions and deductions provided therein, in currents funds as follows:

4. PROGRESS PAYMENTS. - The owner shall make progress payments on account of the contract as follows: On or about the 25th 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 say of that month, as estimated by the architect, less the aggregate of previous payments, until one-half of the contract sum is due. Payments will be made between the 15th and 20th of the following month.

If the work is.....

- (a) On or ahead of the constructions 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 Subparagraph (k) and (n) of Article E-15 of the general conditions when one-half of the contract sum is due no further retainage will be withheld by the owner from payments to the contractor unless...

Event (a) The percentage 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 Subparagraphs (k) and (n) of Article E-15 of the general conditions,

in which event or events the owner shall reinstate the 10 percent 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 condemnation; 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 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 _____ 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 final certificate, is due and payable.

(Form No. 418) (10-31-74)

(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 claims.

6. THE CONTRACT DOCUMENTS. - The general conditions of the contract, the specifications, the drawings, the signed proposal form, and the notice of acceptance of the said proposal 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 premium thereon. The performance bond shall guarantee the full performance of the contract.

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

Contracting Firm: _____

By: _____

Title: _____

Date: _____

Notary: _____

COUNTY BOARD OF EDUCATION OF RICHMOND COUNTY

By: _____

Title: _____

Date: _____

Notary: _____

SECTION F

SPECIAL CONDITIONS

F-01 Co-Ordination of Construction:

A - Pre-Construction Conference

Before any work is started, the Contractor, major subcontractors and superintendent for construction shall meet with the Architect/Owner's Representative to coordinate all new construction and to allow minimum disruption of existing facilities.

B – Construction Progress Meetings (OAC Meetings)

Construction project meetings will be formally held a minimum of twice per month. The CONTRACTOR is responsible for preparing meeting agenda, schedules and logs needed for review and conducting the meeting. Meetings will be documented with meeting minutes issued by the Contractor within 3 days of the meeting. Format of the meeting and agenda requirements will be established by the Program Manager. As required in Section E, schedule updates and submittal logs will be provided at these meetings.

C - Security

New construction shall be left secure at the end of each day. The Contractor is responsible for any damages, loss of items, etc. due to this deficiency

D - Material Storage

- (1) Any exterior on-site storage required by the Contractor shall be inside the temporary fenced area.
- (2) Exterior storage facilities shall be furnished by the Contractor and erected inside the temporary fenced area.
- (3) The Contractor shall provide, maintain and remove where directed suitable, substantial, water tight, secure storage for protection of material used in this work. Damaged, defective or unsuitable wet or damp materials shall be removed promptly from the site. Polyethylene covers are not acceptable. All roofing materials are stored under ventilated tarpaulins completely covered and raised off the ground.

F-02 SMOKING: The Contractor shall post notice and prohibit employees from using or displaying tobacco products, including smokeless tobacco, while the employee is on duty at the assigned location, for the duration of the project. There shall be no use of any tobacco product on any property of the Richmond County Board of Education.

F-03 TRASH DISPOSAL: The Contractor shall allow no trash to accumulate outside the buildings or work area. Area shall be cleaned at the close of each working day. Trash shall be disposed of off the school site. Burning of the material on the site will not be permitted.

F-04 FENCING:

The Contractor shall maintain and erect construction fencing and gates around the new construction area to provide protection of the public and Owner during the execution of the Contract.

- (1) Construction fence with metal tee studded steel posts with clamps. Install 6'-0" non-climbable heavy gauge wire fencing. Posts shall be spaced 10'-0" o.c. or less (4"x4" wood posts may be used in lieu thereof).
- (2) Provide gates at such locations as necessary, cross-braced and hung on heavy strap hinges, and provide hasps and padlocks.
- (3) This fence shall be erected before any work is started and in accordance with schedule approved by the Owner and Architect. On completion of the work or when directed by the Architect/Program Manager, the fences shall be removed by the Contractor and shall become his property and be removed from the site.

F-05 SANITATION:

The Contractor shall provide from the beginning of work washing facilities and temporary enclosed toilets for use of workmen on job. Such facilities shall be maintained in a clean and sanitary condition meeting all health standards throughout their use. The Contractor shall not permit any sanitary nuisance in or about the work area. Toilet facilities shall be located outside of the building work area.

F-06 PERMITS:

- A - All permits, licenses, fees, electrical, sewer or water tap costs, etc., required for construction to be obtained and paid for by the Contractor.

F-07 OSHA

- A - Every safety precaution will be taken during all stages of construction. All OSHA Safety requirements will be adhered to.

F-08 SAFEGUARDS:

- A - Contractor will be held liable for all damages to personal and real property as a result of his negligence to provide protective measures.
- B - When the need for protection installed no longer exists, the Contractor shall remove such protection devices.

F-09 TEMPORARY HEAT & AIR CONDITIONING:

- A - The Contractor shall provide as his own expense temporary heat to protect all work and materials against injury from dampness and cold and to dry out building. Maintain building at a minimum of 60° during working hours, after building is "dried-in" ..

F-10 CUT-IN AND METERS:

- A - Contractor is to apply for, pay for and install all utility cut-in and meters.

F-11 PROTECTION:

- A - Preserve in operating condition all active utilities traversing the project site; protect manholes, catch basins, valve boxes and other appurtenances. Repair damage to any such utility, due to work, under this contract, to the satisfaction of the Architect. Care must be taken to protect and preserve all trees within the site that do not fall within the building area itself.

F-12 MATERIALS AND PRODUCTS CONTAINING ASBESTOS

- A - The use of asbestos in any product incorporated within these specifications by any Contractor, Subcontractor, Manufacturer or material supplier is prohibited.

It is the intention of the Architect not to specify, approve or use any material that contains asbestos in any form. If materials included in these specifications contain asbestos, it shall be interpreted to be unknown to Architect. The Contractor, subcontractors, material suppliers and manufacturers shall notify Owner and Architect of materials containing asbestos and shall not supply or incorporate such materials in this project. If installed by the Contractor, it will be removed at the Contractor's expense.

F-13 JOB SITE SAFETY:

- A - Job site safety shall be the sole responsibility of the Contractor.

F-14 "ALL RISK" BUILDERS RISK INSURANCE:

- A - General Contractor shall purchase and maintain during the full course of construction "All-Risk" Builders Risk Insurance Coverage which names the Contractor, Owner, the Architect, and Engineers as co-insured.

F-15 SHOP DRAWINGS:

- A - Contractor shop drawings shall be reviewed only for general conformance with the intent of design for and for general compliance with the construction contract.

F-16 CONTRACT DOCUMENTS:

- A - The Contractor is responsible for examining all contract documents to determine if all drawing sheets and specification sheets contained in the sets agree with their respective indexes. The Architect will be notified prior to Bidding of any sets not complete. Any incomplete sets will be replaced.

- F-17 Construction documents shall be issued to the contractor in a reasonable number in which it will take to construct the project. Any drawings above that number shall be issued at the contractor's expense. The contractor is allotted the following:

<u>Cost of project</u>	<u>sets of drawings/specs</u>
\$ 50,000.00 or less	8
\$ 100,000.00 or less	10
\$ 250,000.00 or less	12
\$ Above \$250,000.00	15

- F-18 SANITARY ARRANGEMENTS: The contractor shall post notice and take such precautions to keep the premises and all portions of the building clean and sanitary at all times. Temporary enclosed toilets are to be erected. These toilets are to be maintained in a sanitary condition by the General Contractor, and comply with State and Health Department requirements. The toilets of the Board of Education are not to be used by the contractor. The contractor is responsible to make sure that all employee (subs) use these temporary toilets.
- F-19 STORAGE AND CARE OF MATERIALS: The contractor shall provide, maintain and remove when directed watertight storage for protection of materials used in this work. Damaged or defective materials shall be removed from the site.
- F-20 CONTRACTOR'S FIELD OFFICE: At the beginning of construction, the contractor shall maintain an enclosed field office, complete with all pertinent plans, specifications, and shop drawings. A temporary telephone shall be installed for the duration of construction. Space for review of drawings by Architect and Owner shall be provided.
- F-21 SHOP DRAWINGS AND SAMPLES:
- (A) Shop Drawings
- (1) General Contractor shall check, approve and submit all shop drawings to Architect on sepia paper with positive side up or on original tracings. Sepias shall be a good quality, legible - do not fold.
 - (2) Copies Required:
 - a. 1 Sepia or original (Contractor checked and approved).
 - b. 2 prints of Contractor checked and approved drawings.
 - (3) Reproducible prints (sepias) will be returned to the General Contractor with Architect's Review including information as to changes required marked thereon. Architect will retain print and make such additional copies as he may require for his own information and file.
 - (4) Where appreciable changes are required, Architect may require that drawings be revised, corrected, and resubmitted in accordance with subparagraph, (1) and (2) above.
 - (5) Shop drawings shall comply with Architect's Review prior to manufacturing or fabricating any item or items in the project requiring shop drawings.
- (B) Samples
- (1) Samples required under various Divisions of work shall be delivered to and stored at the job site until checked and approved, or disapproved. Resubmit samples as required.
 - (2) RELEASE OF SAMPLES - When samples have served the purpose for which submitted, Contractor shall notify respective suppliers who may arrange for removal of samples. If, within, two weeks of notice, samples have not been removed, Contractor may dispose of them at his discretion.
- (C) Manufacturer's Literature - Submit number of copies as required under various divisions of work.

F-22 BATTERBOARDS, LINES AND LEVELS: The contractor shall lay out the lines of the building, checking them with the lot lines. He shall mark the lines of the building on solidly constructed batter boards. The contractor shall maintain these batter boards and shall direct his engineer to run and test all lines and levels from time to time. The contractor shall be help responsible for the accuracy of the whole work throughout its progress.

F-23 SHOP DRAWINGS AND SUBMITTALS: Shop drawings and submittals are requested and checked by Architect to assist Contractor in confirming compliance with contract documents and shall be accepted by Architect subject to the following conditions:

- A. Contractor shall check drawings, mark corrections and stamp drawings. Shop drawings and submittals shall not be accepted unless so indicated.
- B. Changes from contract documents shall be clearly indicated on drawings and accompanied with letter indicating reasons for change
- C. Under no circumstances shall contract requirements be changed by shop drawings unless specifically approve by Architect and Owner. Failure of Architect to detect such a change does not justify changing contract requirements even if drawings are marked "Approved" or "No Exceptions" or "Note Markings".
- D. Material and equipment ordered, fabricated and delivered under conditions described in Paragraph "C" above shall be removed, replaced and corrected by Contractor at no additional cost to Owner.
- E. Drawings and submittals poorly prepared and requiring numerous corrections shall be returned without complete check and corrections marked for resubmittal.
- F. Submittals shall be complete. If shop drawings, samples and submittal data are required all shall be submitted to Architect at the same time. Parts of an incomplete submittal shall not be accepted and shall be returned to Contractor until complete submittal is received.
- G. Architect's drawings shall not be duplicated or copied for use as shop drawings.

F-24 FINAL INSPECTION PROCEDURE

After all work is complete and Contractor submits request to Architect, including list of incomplete work which is beyond control of Contractor, Architect shall commence final inspection procedure.

- A. Purpose - Final inspection is not intended to provide Contractor with list of incomplete work which he uses to complete project, but is for the purpose of final acceptance, final payment and occupancy by Using Agency
- B. Preliminary Final Inspection - Conducted by Architect/Program Manager, Engineers and Contractor to confirm that all work is complete and to prepare list of items which must be corrected prior to final inspection.
- C. Final Inspection - Conducted by Architect/Program Manager (Owner's Representative), Engineers, and Contractor to confirm that all work is complete.
- D. Final Inspection Follow-Up - Conducted by Architect/Program Manager, Engineers, and Contractor to confirm that defective and incomplete items listed during final inspection have been completed, and to determine that final payment, including retainage, is due.
- E. False Starts - Architect/Program Manager is not obligated to conduct numerous inspections in order to assist Contractor to complete project. Any inspections required due to incomplete work, other than three listed above, shall be deemed as false starts or to have been requested prematurely, and next inspection shall not be conducted until Architect and Engineers have been reimbursed by Contractor for wasted time due to previous false start.
- F. Determination That Project Is Ready For Final Inspection - Architect and Engineers shall be responsible for determining that their respective phases of work are complete and that portion or project is ready for final inspection. If, after commencing an inspection, project is determined not to be ready for inspection, that shall constitute a false start.

F-25 REMOVAL OF WASTE FROM SITE:

Contractor shall have a solid waste handling permit by rule issued by the Georgia Environmental Protection Division complying with Section 391-3-4-.06(3)(a) of the Rules for Solid Waste Management:

1. Vehicle Construction: Vehicles or containers used for collection and transportation of garbage and similar putrescible wastes, or mixtures containing such wastes, shall be covered, substantially leakproof, durable, and of easily cleanable construction.
2. Vehicle Maintenance: Solid waste collection and transportation vehicles shall be cleaned frequently and shall be maintained in good repair.
3. Littering and Spillage: Vehicles or containers used for the collection and transportation of solid waste shall be loaded and moved in such a manner that the contents will not fall, leak or spill therefrom and shall be covered when necessary to prevent blowing of material from the vehicle.
4. No regulated quantities of hazardous wastes may be collected and transported except in accordance with the provisions of the Georgia Hazardous Waste Management Act, O.C.G.A. 12-8-60 et seq.
5. Local Ordinances: It is the responsibility of the collector to comply with all local rules, regulations, and ordinances pertaining to operation of solid waste collection systems.
6. All wastewater from cleaning of vehicles must be handled in manner which meets all applicable environmental laws and regulations.
7. All collected solid waste must be deposited only in a permitted solid waste handling facility authorized to receive the applicable waste types.
8. After July 1, 1992, municipal solid waste may not be transported from a jurisdiction to a municipal solid waste disposal facility located in another county unless the jurisdiction generating the waste is actively involved in and has a strategy for meeting the State-wide goal of waste reduction by July 1, 1996.

The contractor shall disclose the landfill in which they will be using in subject project.

The contractor shall provide to the Richmond County Board of Education solid waste tipping fee receipts from the landfill.

Definitions

“Collector” means the person or persons as defined herein who, under agreements, verbal or written, with or without compensation does the work of collecting and/or transporting solid wastes, from industries, offices, retail outlets, businesses, institutions, and/or similar locations, or from residential dwellings, provided however, that this definition shall not include an individual collecting and/or transporting waste from his own single family dwelling unit.

“Construction/Demolition Waste” means waste building materials and rubble resulting from construction, remodeling, repair, and demolition operations on pavements, houses, commercial buildings and other structures. Such wastes include, but are not limited to asbestos containing waste, wood, bricks, metals, concrete, wall board, paper, cardboard, inert waste landfill material, and other nonputrescible wastes which have a low potential for groundwater contamination.

Rev 4-17-00

Section G

Project Close-Out Requirements and Procedures

Article G-01. General Provisions

The following *Project Close-Out Requirements and Procedures, Articles G-01 to G-11*, inclusive, bound herein and hereafter referred to as the “Project Close-Out Requirements and Procedures” provide the requirements and procedures for the close-out of the project and are binding to the contract. There are references to these and other requirements and procedures in other sections of the specifications. Requirements and procedures in other sections that are in addition to those in this section are also binding to the contract. Where conflicts arise between the requirements of this section and other sections of the specifications, the more stringent requirement will govern.

Contractor will provide two hard copies of all closeout documents in the section and one electronic copy on a flash drive. All documents will be organized and clearly labeled.

Article G-02. Close-Out Requirement Retainages for Final Payment

- (a) The completion of the Close-Out Requirements and Procedures is critical to the Owner’s ability to manage, operate and maintain the facility and is therefore a valuable part of the project. To help ensure the proper completion of the Close-Out requirements and procedures, the following values are established for each of the components of the Close-Out requirements. The value for each component will be held as retainage until ALL requirements of that component are submitted, reviewed and approved. NO partial release of the retainage for a component will be made; the retainage for a component will only be released when that component is 100% complete and approved.
- (b) The following are the retainage values for each component of the Close-Out requirement. Items (a), (b) and (c) are required to be completed and turned over to the Owner prior to or at the time of substantial completion. If a component (d) through (h) is incomplete after 120 days, the Contractor will forfeit the retainage for the component to the Owner as compensation for the efforts that will be required by the Owner to obtain/complete the items in the component.

	Contracts < \$2 Million	Contracts \$2 - \$5 Million	Contracts > \$5 Million
(a) Initial Owner Hand-Off Session	\$2,000	\$5,000	\$5,000
(b) Close-Out Documents	\$5,000	\$5,000	\$10,000
(c) Training	\$5,000	\$5,000	\$5,000
(d) Certifications & Warranties	\$5,000	\$5,000	\$10,000
(e) Spare Part, Tools & Attic Stock	\$2,000	\$5,000	\$5,000
(f) As-Builts, Drawings & Reports	\$3,000	\$5,000	\$10,000
(g) O&M Manuals	\$2,000	\$3,000	\$5,000
(h) Finishes Listing	\$2,000	\$2,000	\$2,000

Note: Various Close-Out Documents must be submitted and approved by the Architect and Owner before **ANY** retainage is released, so the retainage holdings above apply only after the required documents to reduce the overall project contingency have been submitted and

approved. See the following articles and General Conditions for requirements for reduction of retainage.

Article G-03. Initial Owner Hand-Off Session

- (a) At the direction of the Architect and Program Manager, in coordination with the Owner, the Contractor will conduct an Initial Owner Hand-Off Session for the project **at the time of substantial completion and prior to the time when the Owner takes occupancy of the building**. In order to prepare for the transition from Contractor control of the construction site to the Owner control of the new facility, an Initial Owner Hand-Off Session will be conducted. This session is NOT intended to be the training session for the individual systems and equipment required by the contract. This session is intended to be an opportunity to familiarize the District staff with the facility and provide them with the necessary documentation and orientation of the systems in the building(s) so District staff may properly and effectively manage the facility once it is turned over.
- (b) Issues to be covered at the Owner Hand-Off Session:
- a. Draft O&M Manuals: The Contractor will provide draft manual of all mechanical, electrical and motorized equipment for the Owner's use until the final O&M Manuals have been submitted, reviewed and approved by the Architect.
 - b. Keys and Access Codes: The Contractor will provide an inventory of which keys and codes have been provided and which are outstanding, as well as a schedule for providing the remaining keys and codes.
 - c. Training Status : The participating parties will review the training status for required Owner training, including an inventory of which trainings have been conducted and which are outstanding, as well as a schedule for conducting the remaining training.
 - d. Subcontractor Walkthrough: The subcontractors will walk the maintenance staff through the building and provide an orientation on all systems installed by subcontractor as well as review basic safety, operation and monitoring processes. If the formal Owner training has been conducted prior to this session, the orientation for those systems will not be necessary. If the formal training has not been completed, this orientation will provide the Owner's staff with the basic information to allow them to occupy and "operate" the systems until the formal training is completed.
 - e. Interim Set of Project Plans: The Contractor (with the assistance of the Architect) will provide the Owner with an interim set of project plans and specifications for use on-site until the final as-built plans have been submitted, reviewed and approved by the Architect.
 - f. Maintenance Responsibility Turnover: The Contractor will provide a **written notification** to the Owner regarding which items/areas the Contractor is turning over for the Owner to assume responsibility for maintenance and operations. This procedure eliminates confusion regarding which party is responsible for maintenance and operation of certain systems, equipment, grounds and the like.

(c) Required Participation in the Owner Hand-Off Session:

- a. Required Contractor/Subcontractor Personnel to be present at a minimum:
 - i. General Contractor Project Manager and Superintendent
 - ii. HVAC Subcontractor Superintendent
 - iii. Electrical Subcontractor Superintendent
 - iv. Plumbing Subcontractor Superintendent
 - v. Other Subcontractors as requested by the Owner, Architect or Program Manager
- b. Owner Representatives who may be present:
 - i. Director of Maintenance and Custodial Services, or his designated representative
 - ii. School/Facility Custodial Staff
 - iii. Maintenance Department HVAC Supervisor
 - iv. Maintenance Department Electrical Supervisor
 - v. Maintenance Department Plumbing Supervisor
 - vi. Assistant Director of Construction and Renovation
- c. Project Architect and Engineers
- d. Program Manager

(d) Initial Owner Hand-Off Session Checklist

- a. The results of the Initial Owner Hand-Off Session will be documented on the Initial Owner Hand-Off Session Checklist included herein.
- b. A copy of the completed Checklist will be submitted to the Owner (through the Architect) as a component of the project close-out process in order to provide a record of the items covered as well as a roster of the individuals who participated in the Initial Owner Hand-Off Session.

Initial Owner Hand-Off Session Checklist

School/Facility:

Date:

	Draft O&M Manuals	Keys	Access Codes	Training Status	Walkthrough with Subcontractor
HVAC - Mechanical Equipment					
HVAC Controls					
Lighting Controls					
Fire Alarm					
Intercom					
Security/Intrusion System					
Video Surveillance					
Video Distribution System					
Data/Voice System					
Athletic Equipment (bleachers, goals, etc)					
Elevators					
Building Keys	Required to be sent directly to Maintenance Department				
Landscape and Field Irrigation Sys.					
Other:					
Other:					
Other:					

Interim Set of Plans and Copy of Specifications

Maintenance Responsibility Turnover Notification (List/Letter)

Walk through with Maintenance Staff and Key subcontractors

In order to prepare for the transition from Contractor control of the construction site to the Owner control of the new facility, an Initial Owner Hand-Off Session will be conducted. This session is NOT intended to be the training session for the individual systems and equipment required by the contract. This session is intended to be an opportunity to familiarize the District staff with the facility and provide them with the necessary documentation and orientation of the systems in the building(s) so District staff may properly and effectively manage the facility once it is turned over.

Initial Owner Hand-Off Session Attendance Roster

School/Facility:

Date:

Contractor and Subcontractors:	
Name	Company

District and School Staff	
Name	Department

Architect and Engineers	
Name	Company

Program Manager	
Name	Company

Article G-04. Early Certifications and Document Requirements

- (a) The Contractor will provide copies of the Early Certifications and Documents from Permitting Agencies and Governmental Agencies which are required for occupancy of the facility. **The complete submittal must be made at the time of project turn over and Owner occupancy, or earlier if certifications and inspections are completed well ahead of Owner occupancy. The Early Certifications and Documents will be submitted in a complete package to the Owner through the Architect.**
- (b) The following Certifications, Documents and Items are Required:
- a. Certificate of Occupancy
 - b. Fire Alarm System Certification
 - c. Fire Sprinkler System Certification
 - d. Augusta/Richmond County Building Inspector Letter of Completion
 - e. Augusta/Richmond County Fire Department Life Fire Safety Report
 - f. Department of Labor Boiler Certificates
 - g. Department of Labor Elevator Certificates
 - h. Certificate of Water System Disinfection
 - i. Permanent Keys

Article G-05. Close-Out Documents

- (a) The General Conditions and Contract require specific contractual documents to be provided by the Contractor at Close-Out in order to complete the obligations of the Contractor and to provide required contractual protections for final payment. The Close-Out Documents shall be submitted as a complete package to the Owner through the Architect.
- (b) The following are the minimum contract Close-Out Documents required for final payment. Additional documents may be required by the General Conditions, Contract or other specifications provided in the Bid and Contract Documents. **Items "a" through "e" MUST be submitted before ANY project retainage can be released.**
- a. ***AIA G707 – Consent of Surety Company for Final Payment***
 - b. ***AIA G706 – Contractor's Affidavit of Debts and Claims***
 - c. ***AIA G706A – Contractor's Affidavit and Release of Liens from***
 - i. ***General Contractor***
 - ii. ***Sitework Subcontractor***
 - iii. ***Mechanical Subcontractor***
 - iv. ***Plumbing Subcontractor***
 - v. ***Electrical Subcontractor***
 - vi. ***Other Major Subcontractors***
 - vii. ***Major Material Suppliers/Vendors***
 - d. ***Statutory Affidavit***
 - e. ***Non-Influence Affidavit***
 - f. Certificate of Substantial Completion
 - g. Contractor's Written Guarantee on Company Letterhead
 - h. Contractor's Cleanup Letter on Company Letterhead
 - i. Contractor's Asbestos Letter on Company Letterhead (No Asbestos Used)
 - j. List of Subcontractors/Suppliers/Vendors (Must include services/materials provided, company name, address, phone numbers, contact person's name and e-mail address)
 - k. Low Voltage Systems Certifications (for systems other than Fire Alarm Systems Certification, which is required as part of Early Certifications and Documents)

Article G-06. Training Requirements

- (a) The Contractor will provide training for all equipment and systems installed by the Contractor. The Contractor shall be responsible for scheduling all training with the Owner, in coordination with the Architect, through the Owner's designated representative and at a time convenient to the Owner's staff.
- (b) Training Requirements:
 - (a) Two levels of training are required for systems and equipment.
 - i. The first level of training is for the District Maintenance Staff. The Contractor MUST provide training to CERTIFY the District Maintenance Staff to the level of being "FACTORY CERTIFIED" to operate, maintain, service and repair any equipment, system or device that requires certified personnel to operate, maintain or repair these items in order to maintain warranties and operate the system/equipment in compliance with codes and regulations. The Owner must be able to operate, maintain and repair ALL equipment, systems and devices installed in the facility WITHOUT the assistance of the Contractor, manufacturer or other outside entity.
 - ii. The second level of training is for the Facility Staff. This will be the user level training on the operation of the equipment/systems and will be performed separately from the District Maintenance Staff training. This training will be conducted on-site and will be performed by the Manufacturer's certified and authorized training personnel. Applicable subcontractor/vendor personnel will be present at the training session along with the Contractor's superintendent. The District Maintenance Staff will also attend this training session to observe the training being conducted.
 - (b) The Contractor will provide at the time of training all special tools, cables, equipment, software, laptops and the like that may be required for the monitoring, operation, maintenance and repair of the systems, equipment and devices.
 - (c) The Contractor will generate an attendance roster of the training session showing the date, time, location and names, company and phone numbers of everyone attending the training session including the Contractor/Subcontractor/Vendor and the Owner's staff.
 - (d) The Contractor will submit a Close-Out Package for Training to the Owner to document the training conducted with the following documents:
 - i. Letter on Company Letterhead indicating that ALL required training has been completed;
 - ii. List of all training sessions held both on-site and off-site;
 - iii. List of all tools, cables, equipment, software, laptops or other devices that were provided to Owner during training; and
 - iv. Copies of attendance rosters for all training sessions.

- (e) Unless designated otherwise, the Contractor will be expected to provide the CERTIFIED level of training for the District Maintenance Staff for the following systems/equipment:
- i. ALL HVAC Equipment
 - ii. HVAC Controls System
 - iii. Fire Alarm System
 - iv. Intercom System
 - v. Video Distribution System
 - vi. Data and Voice Systems
 - vii. Security Systems
 - viii. Video Surveillance Systems
 - ix. Generators
 - x. Kitchen Equipment
- (f) On-site user level training will be required at a minimum for the following systems. Other training may be required for systems not listed that require operation and/or maintenance activities from the Owner for the routine operation of the facility.

- i. ALL HVAC Equipment
- ii. HVAC Controls System
- iii. Boilers
- iv. Booster Pumps
- v. Water Treatment Systems
- vi. Fire Alarm System
- vii. Intercom System
- viii. Video Distribution System
- ix. Data and Voice Systems
- x. Security Systems
- xi. Video Surveillance Systems
- xii. Generators
- xiii. Kitchen Equipment
- xiv. Carpet Maintenance
- xv. Science Casework

Article G-07. Certifications, Warranties and Bonds

- (a) Certifications, Warranties and Bonds will be provided in a separate Close-Out Package. This is to be provided in a 3-ring binder with all documents in clear protective covers. A directory with a listing of all documents will be provided at the front of the book. The Directory will include a list of products, manufacturers, length of warranty and contact information for each manufacturer for extended warranties after Contractor's warranty/guarantee has expired to include address, phone number and e-mail address. The Certifications, Warranties and Bonds Close-Out Package will be submitted in one complete package to the Owner through the Architect.
- (b) The items listed in Item (c) below are required to be included in the Certifications, Warranties and Bonds Close-Out Package. Other Certifications, Warranties and Bonds that are required by the Architect or Engineer in the technical specifications, but not listed here, MUST also be included in the Close-Out Package.

(c) Required Certifications, Warranties and Bonds

- a. Asbestos Abatement Certification
- b. Asbestos Tipping Receipts
- c. Notice of Termination (N.O.T.) for Erosion Control
- d. Contractor Certification that final grades are per plans
- e. Roof Warranty – 20 Year Minimum
- f. Mechanical Diagnostic Code Data and Troubleshooting
- g. Mechanical Equipment – 5 year compressor warranty
- h. Cooling Tower Performance Certification
- i. Lightning Protection Certification
- j. Generator – 5 year warranty
- k. Termite Treatment Bond
- l. Termite Treatment Maintenance Proposal/Agreement
- m. Intrusion Detection System – 2 Year Maintenance Agreement
- n. Video Surveillance System– 3 Year Service Warranty
- o. Carpet Installation – 1 Year Guarantee
- p. Carpet Material – 3 Year Guarantee / 15 Year Warranty
- q. MSDS Sheets on mastic for carpet & tile
- r. Toilet Partitions – 10 Year Warranty
- s. Science Casework – 1 Year Guarantee
- t. Media Casework – 1 Year Guarantee
- u. Casework – 3 Year Guarantee/ 10 Year Warranty
- v. Irrigation System Warranty
- w. Certificates from Manufacturers of Major Components (see Article E67 of the General Conditions)
 - i. Major Components of AC Systems: cooling towers, compressors, condensers, absorption units, chillers, fan coils air handlers, boilers, pumps and temperature controls
 - ii. Major Components of Heating Systems: boilers, pumps, air handlers, unit ventilators, fan coils, temperature controls and chemical feed systems
 - iii. Major Components of Plumbing Systems: boilers, pumps, sewage pumps and water treatment systems
 - iv. Elevators, Lifts, Escalators
 - v. Incinerator Systems

Article G-08. Spare Parts, Tools and Attic Stock

- (a) As part of the project requirements the Contractor will be required to turn over spare parts, tools and attic stock to the Owner at project turnover. These items are to be turned over to the Director of Operations (or his designee) (RCSS Maintenance and Facilities, 2956 Mike Padgett Hwy, Augusta, GA 30906
- (b) The Contractor will be required to coordinate the turnover of ALL the parts, tools and attic stock with the Director of Operations, Maintenance and Facilities or his designated representative. At the time of turnover, the Contractor will provide a DETAILED list of ALL items being turned over to include list of each part and item, colors, sizes, quantities or other pertinent information. The Contractor MUST obtain the signature on a Letter of Transmittal, by the Director of Operations, RCSS Maintenance and Facilities, or his designee, though the Architect..

- (c) The Contractor will submit to the Owner a Close-Out Package for Spare Parts, Tools and Attic Stock in order to document the items turned over. This submittal will include a listing of all items turned over, as well as the signature of the Owner's staff person acknowledging receipt of the items. This submittal will be made to the Owner through the Architect.
- (d) The following items are required by the Owner as minimum items to be turned over. Other items as specified by the Architect and Engineer in their specifications will also be turned over with the same process and must be documented in the same manner as part of the turn over submittal. In cases where the Owner and Architect/Engineer require items of the same specification section, the Contractor will provide the quantity which is the GREATER of the two requirements.
 - a. VCT/SVT - 1% of the field tile and 1 box of each accent color
 - b. Ceiling Tile – 1% (minimum of 2 boxes) for standard tile, 1 box of other types
 - c. Paint – 1 gallon new and unopened of EACH color, and type of paint. Clearly labeled
 - d. Carpet Tiles – 1% of each color
 - e. Irrigation systems – 10% of each type of head when 10 or more are installed
 - f. HVAC Filters – 1 complete set for ALL units, IN ADDITION to filter installed at turnover.
 - g. HVAC Controls – 10% of Boards when 10 or more are installed
 - h. HVAC Controls – Laptop for operation of control system (Compliant with current RCSS IT standards for administrative users
 - i. Fire Sprinkler system – spare heads and tools as required by code.
 - j. Spare Parts, Tools and Attic Stock per the requirements of the Architect and Engineer specifications and drawings

Article G-09. As-Builts, Required Drawings and Reports

- (a) The General Conditions and Contract require specific As-Builts, Drawings and Reports to be provided by the Contractor at Close-Out in order to complete the obligations of the Contractor. As-Builts, Required Drawings and Reports will be submitted to the Owner through the Architect.
- (b) All drawings will be provided in hard copy format and in electronic format (PDF).
- (c) The following are the minimum As-Builts, Drawings and Reports required for final payment. Additional documents may be required by the General Conditions, Contract or other specifications provided in the Bid and Contract Documents.
 - a. Registered Land Survey of Site Utilities. **Provide GPS locations** for the following: all exterior valves, switches, and disconnects, boxes, manholes, connections or other key components of the site utility systems; empty 4" PVC sleeves under all new roads and sidewalks for future electrical or mechanical systems; empty conduits for electrical, cable, computer, sewer and water for future portable classrooms, future ball fields or structures (with concrete markers at stub out locations).
 - b. Registered Land Survey of Site Improvements
 - c. **Contractor As-Builts** of Contract Drawings
 - d. Fire Sprinkler System
 - e. Fire Alarm System
 - f. Landscaping and Ball field Irrigation System As-Builts
 - g. HVAC Test and Balance Reports
 - h. Other items required by the Architect and Engineer in the technical specifications and drawings

- (d) The PROJECT ARCHITECT will provide the following documents to the Owner at the completion of the project. These are NOT the responsibility of the Contractor to obtain and submit.
 - a. Architect to provide AutoCAD of Floor Plan w/square footages for each space
 - b. Architect to provide DWG/DXF of ALL Drawings, Specifications and Changes to the design documents.

Article G-10. O&M Manuals

- (a) 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 (through the Architect) complete brochures and data as prepared and published by the manufacturers covering details regarding operation and maintenance.
- (b) Requirements for Operation and Maintenance Manuals can be found in Article E-55 of the General Conditions.
- (c) The Contractor will refer to the Architect and Engineer Technical Specifications to determine specifically what equipment and materials require the submission of Operation and Maintenance Manuals.

Article G-11. Finishes Listing

- (a) The Contractor will provide a listing of all materials installed on the project which are exposed to view. This listing will include the material name, manufacturer, model number, style number, color name or number, and any other information necessary to enable the Owner to order replacement parts/materials which match those installed on the project. This listing will be submitted to the Owner through the Architect.
- (b) The following items at a minimum must be listed on the Finishes Listing, if installed on the project:
 - a. Exterior
 - i. Brick
 - ii. Precast
 - iii. Mortar
 - iv. Metal trim
 - v. Windows
 - vi. Glass tinting
 - vii. Caulk
 - viii. Storefront
 - ix. Paint
 - x. Fascia and Soffits
 - xi. Gutters and Downspouts
 - xii. Metal roof
 - xiii. Shingles
 - xiv. Flashings and Coping
 - xv. Canopies

b. Interior

- i. Paint
- ii. Caulk
- iii. Carpets
- iv. VCT
- v. Vinyl base
- vi. Stair treads, transitions, and similar equipment
- vii. Ceramic tile
- viii. Terrazzo
- ix. Colored concrete
- x. Gym floor sealer
- xi. Gym floor striping paints
- xii. Gym floor base
- xiii. Gym wall pads
- xiv. Bleacher seats
- xv. Toilet partitions
- xvi. Wood doors
- xvii. Casework stains
- xviii. Plastic laminates
- xix. Solid surface tops
- xx. Acoustical ceiling grid
- xxi. Acoustical ceiling tile
- xxii. Acoustical panels
- xxiii. Curtains
- xxiv. Blinds
- xxv. Storefront

(c) Sample format for the Project Finishes Listing is included herein.

Project Finishes Listing

School/Facility: _____

Date:

Exterior	Manufacturer Name	Model Number	Style Number	Color Number	Other
Brick					
Precast stone					
Mortar					
Metal trim					
Window metal					
Glass tinting					
Caulk					
Storefront					
Paint					
Fascia & Soffits					
Gutters & Downspouts					
Metal roof					
Shingles					
Flashings and Coping					
Canopies					
Other:					
Other:					
Other:					

Interior	Manufacturer Name	Model Number	Style Number	Color Number	Other
Paint					
Caulking					
Carpets					
VCT					
Vinyl base					
Stair treads, transitions, etc					
Ceramic tile					
Terrazzo					
Colored concrete					
Gym floor sealer					
Gym floor striping paints					
Gym floor base					
Gym wall pads					
Bleacher seats					
Toilet Partitions					
Wood doors					
Casework stain					
Plastic laminates					
Solid surface tops					
Acoustical ceiling grid					
Acoustical ceiling tiles					
Curtains					
Blinds					
Storefront					
Acoustical panels					
Other:					
Other:					
Other:					

DIVISION 1 - GENERAL REQUIREMENTS
SECTION 01 33 00 – SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

- A. The following provisions shall apply:
Contractor shall compile one completed set of approved Shop Drawings and submittals to turn in with the O & M Manuals.
- B. Contractor shall submit one (1) electronic copy in PDF form of each shop drawing with:
1. Contractor's Review & Approval stamp, signed & dated;
 2. Electronic transmittal form with complete project identification, clearly defined Shop Drawings including references to related Specification or Drawings.
 3. Submit to the Architect for review. If corrections are required after the Architect's review, one PDF electronic copy of marked or comments on Shop Drawings will be returned to the Contractor for necessary revisions or corrections. Contractor shall then resubmit one (1) electronic copy in PDF form of corrected drawings for final review, approval, and distribution. However, if for any reasons further corrections are necessary, follow the above procedure until no corrections are required.
 4. Confirmation physical "Samples" shall be provided to 2KM with transmittal and related instructions. Submit electronic transmittal for electronic files & tracking review process.
 - a. Deliver Samples to 2KM Architects, Inc. Chris Lehi, Contract Administrator. 529 Greene Street, Augusta, GA 30901.
 - b. Field Mock-ups & Sample walls shall be coordinated with Architect & Owner for onsite location.
 5. Contractor shall maintain & update Shop Drawing Log reflecting status and email updates 3-days prior to Progress Review Meetings with Owner/Architect/Contractor. (Bi-Weekly or Monthly as scheduled).
- C. For standard manufactured items the Contractor shall submit electronic copies of all catalogue sheets, vendors' drawings and certified drawings to the Architect for review. If corrections are required after the Architect's review, an electronic copy of marked up drawings will be returned to the Contractor for revision. Contractor shall then resubmit electronic corrected copies for final review and distribution.
- D. Shop drawings submitted for review must bear the stamp of the Contractor stating that they have been checked. It is the Contractor's responsibility to fully check all shop drawings for arrangement and conformance with drawings and specifications, and accuracy of dimensions, including coordination of shop drawings submitted on other work under these specifications. If it appears that such checking has been inadequate, even though stamped as being checked, drawings will be returned to the Contractor for proper checking before further processing by the Architect regardless of any urgency claimed by the Contractor.
- E. The review of such drawings by the Architect will be general only. Such review shall not be interpreted as a checking of detailed dimensions or approval of deviations from plans and specifications, unless such a check or deviation is requested at time of submission. Review of drawings shall not relieve the Contractor of his responsibility for accuracy of same, nor for the furnishing of all materials required by the contract, even though same may not be indicated on the reviewed shop drawings.
- F. The Contractor must schedule the submission of shop drawings and schedules to allow the Architect a minimum of ten working days, after receipt, for the review of each submission. The review of a shop drawing does not authorize changes from the Contract requirements as to materials, workmanship, extent of the work or price unless authorized in a separate Change Order.

- G. Submit shop drawings, vendor drawings and certified drawings, to the Architect with a transmittal letter or form addressed to 2KM Architects, Inc., 529 Greene Street, Augusta, GA 30901. Transmittals shall include the sender's name, the project number, name of the Owner, a list of shop drawing numbers and titles and quantity of each print submitted. In addition, Contractor shall mark each drawing with the project number and name of the Owner.
- H. Architect's Digital Data Files: Electronic digital data files (CAD and BIM) of the Contract Drawings for Contractor's use in preparing submittals can be provided by the Architect for a Service Fee (see Section 01 21 00 "Allowances") and execution of "Digital Transfer Agreement".
- I. Contractor to prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1.2 SAMPLES

- A. The General Conditions covers samples. The following provisions shall also apply:
 - 1. Name of Project.
 - 2. Location of Project.
 - 3. Name of Contractor.
 - 4. Material or Equipment Represented.
 - 5. Manufacturer's data sheets and drawings, if available.
- B. Approval or acceptance of samples will not preclude the rejection of the completed work. After a material has been approved, no change in brand or make will be permitted, unless satisfactory evidence is presented to and approved by the Architect that the manufacturer cannot make delivery of the approved material on schedule. The right is reserved to require submission of samples of any material or any material lists whether or not particularly mentioned herein.
- C. **Physical samples are required for all products requiring a color selection.**

1.3 CERTIFICATES

- A. Contractor shall obtain certificates of approval, acceptance and compliance from all authorities having jurisdiction over the work and deliver these certificates to the Architect. The work will not be deemed complete nor will final payment be made until such certificates have been delivered.

1.4 RELEASE OF WAIVER OF LIENS

- A. Furnish releases and waivers as required by the Contract Documents with final payment application.

1.5 RECORD DRAWINGS

- A. Contractor shall maintain one complete set of Drawings at the site, and as the work progresses, the Contractor shall record all changes and actual dimensions of the installed work where deviations are made from the original drawings or specifications relative to work included in this contract:
- B. On completion of the job, the Contractor shall deliver one print of such corrected drawings to the Architect. The Contractor shall make such additional corrections as the Architect may require and shall then deliver the corrected prints to the Owner.
- C. These Record Drawings are a specific requirement and the Contract will not be considered complete until they have been submitted in an acceptable form.

1.6 WARRANTIES

- A. The Contractor shall deliver to the Architect, upon demand and upon completion of all work under this Contract, a written guarantee made out to the Owner, satisfactorily warranting the

requirements specified under this section. The Contractor's overall guarantee shall cover a period of one year or longer periods as specified. This guarantee shall be binding upon the Contractor, his successors and assigns.

1.7 DOCUMENTS REQUIRED PRIOR TO FINAL PAYMENT

- A. Prior to receipt of Final Payment, the Contractor shall deliver to the Architect the following documents in the quantity indicated: (All copies shall have original signatures and seals.)
1. All Affidavits, Warranties, Certifications, and other documents indicated in the General Conditions, not less than four (4) copies.
 2. Operating and Service Manuals on all equipment including Mechanical and Electrical work, including all on-site training, three (3) copies, bound, labeled, and indexed in 3-ring binders, see General Conditions, and Specification Sections.
 3. Product Data (tests, labs, etc) for all rated materials (Class A, B, C) installed in the building (paints, fabrics, paper, etc). Also, all contractors will be on site with date for each F.M. inspection (scheduled).
 4. Waste Manifests for proper disposal of hazardous waste.
 5. Manufacturers material certificates.
 6. Contact list of all subcontractors including names, addresses and phone numbers.
 7. Comprehensive "Color Section Schedules" as installed.

PART 2 - PRODUCTS

2.1 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within 10 days prior to Bid. Requests received after that time may be considered or rejected at discretion of Architect and Owner with monetary credit unless products are unavailable.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements.
1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Work shall not require redesign and evaluation or increased cost.
 2. Requested substitution does not require revisions to the contract Documents.
 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 4. Substitution request is fully documented and properly submitted.
 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
 7. Requested substitution provides specified warranty.
 8. If requested substitution involves more than one sub-contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION

(Not Used)

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS
SECTION 01 40 00 – QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections and related actions do not limit Contractor's other quality-assurance and control procedures that facilitate compliance with the Contract Documents.
 - 3. Requirements for Contractor to provide quality-assurance and control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Divisions 1 through 26 sections for specific test and inspection requirements.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.
- E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

- I. Testing Agency: An entity engaged to perform specific tests inspections, or both. Testing laboratory shall mean the same as testing agency.
- J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as “carpentry” does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter.” It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.
- K. Experienced: When used with an entity, “experienced” means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 SUBMITTALS

- A. Qualification Data: For testing agencies demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making test and inspections.
 - 6. Description of the Work and test and inspection and method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.

10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and re-inspection.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system assembly or product that is similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform Preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.

- b. Submit specimens in timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
- c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
- 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Document.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect two (2) days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.6 QUALITY CONTROL

- A. Contractor Responsibilities: Quality-control services are indicated as Contractor's responsibility; Contractor will engage a qualified testing agency to perform these services.
 - 1. Contractor will furnish Owner with name, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Payment for these services will be made by Contractor as part of Base Bid.
 - 3. Costs for retesting and reinspection construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be paid directly by Contractor.
- B. Tests and inspections not explicitly assigned to Contractor remain Contractor's responsibility. Provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 1. Contractor shall engage a qualified testing agency to perform quality-control services.
 - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 3. Submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspecting required by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they do direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including services connections. Report results in writing as specified in Section 01 33 00 "Submittals".
- D. Retesting/Reinspection: Provide quality-control services, including retesting and reinspection, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-site tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, on each test inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within thirty (30) days of date established for the Notice to Proceed.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.7 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Contractor will engage a qualified testing agency and special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Contractor as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspection at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting test and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Document.
 6. Retesting and reinspection corrected work.
- B. Conform to special inspection requirements for each trade as required by the Georgia adopted and amended State Building Code, International Building Code, 2018.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 ACCEPTABLE TESTING AGENCIES

- A. CSRA Testing
- B. S&ME
- C. Other Qualified Testing Agencies with prior approval.

3.2 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Architect.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.
- C. Contractor shall pay for all testing and inspection costs.

3.3 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
- B. Protect construction exposed by or for quality control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

3.4 FEES AND PERMITS

- A. The Contractor shall pay all fees and expenses associated with permits and inspections including authorities and agency expenses.
 - 1. Tap Fees:
 - a. Pay for all materials, labor, permit, & tap fees for utilities:
 - 1) Water
 - 2) Fire Water
 - 3) Temporary services.
 - 2. Construction Permits & Fees:
 - a. Pay all fees and costs of permits.
 - b. Pay all licenses & fees for contractors and sub-contractors for Augusta-Richmond County.

END OF SECTION

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 01 41 13 – CODES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS AND WORK

- A. The Division 1 General Requirements, Specifications, Drawings, Addenda and Modifications are binding on all work required for this Project.

1.2 APPLICABLE CODES

- A. The following Building Codes are currently adopted by the State of Georgia:

1.	120-3-3	State Minimum Fire Safety Standards	(effective 01/01/2024)
2.	120-3-20	2015 Rules and Regulation of the State of Georgia - Access to and Use of Public Facilities by Handicapped Persons	
3.	ADA	2010 ADA Standards for Accessible Design	
4.	IBC	2018 International Building Code (w/ GA Amendments 2020, 2022, 2024)	
5.	IFC	2018 International Fire Code	(w/ GA Amendments 2023)
6.	IPC	2018 International Plumbing Code (w/ GA Amendments 2020,2022, 2023, 2024)	
7.	IMC	2018 International Mechanical Code	(w/ GA Amendments 2020, 2024)
8.	IFGC	2018 International Fuel Gas Code	(w/ GA Amendments 2020, 2022)
9.	IEBC	2018 International Existing Building Code	(w/ GA Amendments 2021)
10.	IECC	2015 International Energy Conservation Code (w/ GA Amendments 2020, 2022, 2023)	
11.	NFPA 10	2018 Standard for Portable Fire Extinguishers	(per 120-3-3)
12.	NFPA 13	2019 Standard for Installation of Sprinkler Systems	(per 120-3-3)
13.	NFPA 25	2017 Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems	(per 120-3-3)
14.	NFPA 70	2020 National Electrical Code (NEC)	(w/ GA Amendments 2021)
15.	NFPA 72	2019 National Fire Alarm Code	(per 120-3-3)
16.	NFPA 80	2019 Standard for Fire Doors & Other Opening Protectives	(per 120-3-3)
17.	NFPA 90A	2018 Standard for the Installation of Air Conditioning & Ventilating Systems	(per 120-3-3)
18.	NFPA 101	2018 Life Safety Code	(per 120-3-3)
19.	NFPA 241	2019 Standard for Safeguarding Construction, Alteration, & Demolition Operations	(per 120-3-3)
20.	O.C.G.A. 50-8-18	Energy Efficiency and Sustainable Construction Act 2008	

- B. Reference to other applicable codes and standards are made in other sections of this specification.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS
SECTION 01 42 13 - ABBREVIATIONS AND ACRONYMS

PART 1 - GENERAL

1.1 REFERENCES

- A. Reference to a technical society, institute, association, organization or governmental authority may be made in the Specifications in accordance with the following abbreviations:

AAR	American Association of Railroads
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
AECI	Association of Edison Illuminating Companies
AGA	American Gas Association, Inc.
AGC	Associated General Contractors of America
AGMA	American Gear Manufacturers Association
AHC	Architectural Hardware Consultants
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
ARI	Air-Conditioning and Refrigeration Institute
ASA	American Standards Association
ASC	American Standards Code
ASLA	American Society of Landscape Architects
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASM	American Society for Metals
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association

AWS	American Welding Society
AWWA	American Water Works Association
CBM	Certified Ballast Manufacturers
CGA	Compressed Gas Association
CISPI	Cast Iron Pipe Institute
CRSI	Concrete Reinforcing Steel Institute
DFPA	Douglas Fir Plywood Association
EPA	Environmental Protection Agency
ETL	Electrical Testing Laboratories
FIA	Factory Insurance Association
FM	Factory Mutual
IEEE	Institute of Electrical & Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
JIC	Joint Industrial Council
MCA	Manufacturing Chemists Association
MIA	Marble Institute of America
MSS	Manufacturer's Standardization Society of the Valve and Fitting Industry
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NEC	National Electric Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSC	National Safety Code
NTMA	The National Terrazzo and Mosaic Association, Inc.
NWMA	The National Woodwork Manufacturers Association, Inc.
OSHA	Occupational Safety and Health Act
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PMA	Pump Manufacturer's Association

RLM	Reflector Luminaire Manufacturers
RTMA	Radio-Television Manufacturer's Association
SAE	Society of Automobile Engineers
SCPI	Structural Clay Products Institute
SDI	Steel Deck Institute
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SSPC	Steel Structures Painting Council
TCA	Tile Council of America
TEMA	Tubular Exchange Manufacturers Association
UL	Underwriter's Laboratories
USPS	United States Product Standard

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, toilets, water, and security and protection facilities.

1.2 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction team, Architect, Testing Agencies, and Authorities having jurisdiction.
- B. Sewer, Water, and Electric Power Service: Contractor shall establish and pay all expenses for temporary utilities. Power and water exist on site. Temporary extension & costs are Contractor's expense. Sewer must be self-contained, pumped & removed from site.
- C. Electric Power Service: Provide connections and extensions of services as required for construction operations. Pay all costs.

1.3 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, access routes and parking areas for construction personnel.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install temporary service to comply with NFPA 70 & Georgia Power Standards.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Treat, test and sanitize all water piping prior to connection to water utility. (Richmond County water system.)

1.5 PROJECT CONDITIONS

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

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Portable temporary Chain-Link Fencing: Minimum 2-inch (50-mm), 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide concrete bases for supporting posts.

2.2 TEMPORARY FACILITIES

- A. Construct site project sign & remove upon completion.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
 - 1. Provide in all vehicles & equipment.
 - 2. Provide in Field office/trailer.
- B. Lifts: Lifts for high work shall be as light weight as possible & wheels that will not damage gym wood floors.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities. Restore site to prior condition or new condition of permanent work.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, to make connections for temporary services.
- B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction and permanent water system.
- C. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Architect's Final Certificate, restore facilities to permanent system configuration.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Electric Power Service: Use of Existing Agencies existing electric power service will be permitted, as long as equipment is maintained in a new condition acceptable to Architect.
 - 1. Utility is not extended to areas of work.
 - 2. All costs for extension use of power, temporary, and equipment is Contractor's responsibility and cost.
 - 3. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
- F. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone service to field office. (Reliable wireless is acceptable)
 - 1. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Architect's office.
 - e. Engineers' offices.
 - f. Owner's office & Facility.
 - g. Principal subcontractors' field and home offices.
 - h. Testing Agencies.
 - i. Local and State Agencies.
 - 2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Maintain support facilities until Completion. Remove before Architect's Final Certificate. Personnel remaining after Architect's Final Certificate will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Project Identification and Temporary Signs: Provide Project identification and other signs as indicated on Drawings. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
 - 1. Provide temporary, directional signs for construction personnel and visitors.
 - 2. Maintain and touchup signs so they are legible at all times.
- C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Section 01 70 00 "Execution and Closeout Requirements" for progress cleaning requirements. Pay all costs for box rental and disposal fees.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- B. Barricades, Warning Signs, and Lights: Comply with requirements of State Fire Marshal, OSHA, current IBC & NFPA 241 for erecting structurally adequate barricades, including warning signs and lighting.
- C. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
- D. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of State Fire Marshal, OSHA, GA Building Codes.
 - 3. Develop and supervise an overall fire-prevention and protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 - 2. Contractor shall bear costs of water and electrical power use exceeding nominal historic use, (Power/Water bill) plus 10%.
- C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Final Completion. Complete or, if necessary, restore permanent construction that may have been delayed be-

cause of interference with 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 property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required per Georgia Department of Transportation details and Contract Documents.
3. At Architect's Final Certificate, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 1 Section "Closeout Procedures."
4. Provide full term warranty from date of "Architect's Final Certificate" of all permanent systems used for "Temporary Facilities":
 - a. Site utilities and systems.

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS
SECTION 01 70 00 – EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Occupancy and continued use.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of the installed construction.
 - 8. Correction of the Work.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of all utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
 - 3. Engage and pay for private locate service for underground utility location.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine rough-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls and floors for suitable conditions where products and systems are to be installed.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to

other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a "Request for Information" to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Use standard form & numbering and dated.
- E. Conflicts:
 - 1. Contractor is to refer to the Contract or Special Conditions in regards to inconsistencies among the Contract Documents.
 - 2. ALL conflicts noted shall be promptly reported to the Design Professional.
- F. Match Existing:
 - 1. Where materials are noted in Contract Documents to "match existing", Contractor to provide physical samples of new materials for color approval prior to purchasing or installing.
 - 2. Installed materials that have **not** been approved shall be replaced **at no cost** to the Owner.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings. If discrepancies are discovered, notify Architect promptly.

3.4 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 8ft (2.4m) in spaces without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean and vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instruction of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period.
- J. Limiting Exposure: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to unauthorized access by non-construction personnel during the construction period.

3.6 SEQUENCE OF WORK

- A. Phasing sequence is defined and to be confirmed by contractor for review/approval by owner. This plan will include but is not limited to:
 - 1. Posting temporary directional signs.
 - 2. Temporary closures of portions of Building 5012.
 - 3. Installation of temporary construction barriers, allowing unobstructed egress.
 - 4. Temporary protection of flooring where construction traffic is anticipated, (non-slip protective sheeting).
 - 5. Cleaning the completed area and Owner acceptance prior to closeout.
 - 6. Any areas soiled due to access will require to be cleaned again including wiping down all soiled surfaces.
 - 7. Remove and redirect temporary signs.

- B. All HVAC and Life Safety systems must be operational during occupancy.

- C. Schedule & Sequence:
 - 1. Pre-Construction:
 - a. Examination of existing.
 - b. Permits & fees.
 - 2. Temporary Construction:
 - a. Develop temporary classrooms in P.E. Gym 208.
 - b. Remove cameras in existing CTAE building for relocation to temporary classroom in P.E. Gym 208 per Electrical drawings.
 - c. Coordinate salvage items with RCSS & transport to Maintenance Warehouse.
 - 1) Surplus furniture, fixtures, and equipment.
 - 2) I.T. and fire alarm items.
 - 3) Door hardware (cylinders and lockers).
 - 4) Promethean boards.
 - 3. School Schedule will govern construction activities for:
 - a. Limiting noise, dust, & access to work in occupied areas.
 - b. Shutdown of utilities.

3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- D. Manufacture's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with manufacturers qualification requirements.

3.8 PROTECTIVE OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

- B. Comply with manufacturer's written instruction for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS
SECTION 01 74 00 – CLEANING AND WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Prior to final acceptance by the Owner, the building and surrounding grounds are to be put in clean and orderly condition. In all instances, the subcontractors are directly responsible for the neatness and orderliness of their work. However, it will be the General Contractor's final responsibility to ascertain the entire project is in a thoroughly clean and acceptable condition.

1.2 CLEANING OF METAL WORK

- A. All exposed metal work shall be thoroughly cleaned before final acceptance of the project. During construction, all exposed metal, finish hardware and all other exposed finish metals shall be protected with polyethylene film, vaseline or other appropriate protective covering. Immediately prior to final acceptance, such metals shall be thoroughly cleaned. No damaged, scratched, stained, injured or discolored materials will be accepted and must be replaced.

1.3 CLEANING OF GLASS & GLAZING

- A. All glasswork shall be cleaned thoroughly prior to final acceptance. Glass shall be cleaned inside and outside in accordance with glazing manufacturer's recommendations. Broken or scratched glazing shall be cause for rejection and requires replacement of the work. Clean away all excess construction materials and sealant. Clean and polish all mirrors.

1.4 EXTERIOR CLEANING

- A. The grounds around the building, lay-down and work areas are to be left in a clean condition. Trash, debris, or unused materials are to be removed from the site. Included is the final cleaning of all existing work soiled or damaged by construction activities.
- B. Restore all lawns and planting areas to match existing conditions.

1.5 FINAL CLEAN-UP

- A. Prior to Architect's Final Inspection, execute final clean-up as follows:
 - 1. Remove all debris from within building and building site.
 - 2. Remove all stains, spots, marks, and dirt from finish surfaces of the work.
 - 3. Remove all paint spots and smears from all surfaces.
 - 4. Clean all fixtures and equipment.
 - 5. Replace damaged materials.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DIVISION 1 – GENERAL REQUIREMENTS
SECTION 01 77 00 – CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
1. Inspection Procedures.
 2. Record Drawings.
 3. Closeout Documentation.
 4. Operations and Maintenance (O & M) Manuals.

1.2 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, the Contractor shall complete the following:
1. Prepare a list of items to be completed and corrected “Preliminary Punch List”, indicate the value of items on the list, and reasons why the Work is not complete. The Architect will evaluate and add items as necessary at time of inspection.
 2. Advise Owner of pending insurance change over requirements.
 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 5. Prepare and submit Project Record “Red Lined Prints”, operation and maintenance manuals, and similar final record information.
 6. Deliver tools, spare parts, extra materials, and similar items to a location designated by the Owner. Label with manufacturer’s name and model number where applicable.
 7. Make final change over of permanent locks and deliver keys to Owner. Advise Owner’s personnel of change over security provisions.
 8. Complete startup testing of systems.
 9. Submit test records and certify water systems sterilization tests.
 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 11. Advise Owner of change over in power and other utilities.
 12. Submit change over information related to Owner’s occupancy, use, operation, and maintenance.
 13. Complete final cleaning requirements, including touch-up painting.
 14. Touch-up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion.
1. Results of completed inspection will form the basis of requirements for Substantial Completion.
 2. Contractor shall identify the schedule to complete all work for certified “Final Completion”.

1.3 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting Final Inspection for determining date of Final Completion, complete the following:
1. Submit a Final Application for Payment according to Section 01 33 00 “Submittals”
 2. Submit certified copy of Architect’s Substantial Completion inspection list of items to be completed or corrected (Preliminary Punch List), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Instruct Owner’s personnel in operation, adjustment, and maintenance of products, equipment, and systems. Provide documentation of training.

- B. Inspection: Submit a written request for Final Inspection for acceptance. Indicate areas needing correction from Preliminary Punch List. Final inspection will require 48 hours prior notice.

1.4 LIST OF INCOMPLETE ITEMS (FINAL PUNCH LIST)

- A. Contractor shall submit written estimated schedule for completion to the Owner and Architect. The Architect will coordinate a final review of the remaining items on the Final Punch List.
- B. Subsequent inspections shall be at the Contractor's expense.

PART 2 – PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of prints of the Contract Drawings with incorporated Addenda and approved Change Orders.
 - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Revisions to routing of piping and conduits.
 - d. Revisions to electrical circuitry.
 - e. Actual equipment locations.
 - f. Locations of concealed utilities.
 - g. Changes made by Change Order or Change Directive.
 - h. Changes made following Architect's written orders.
 - i. Details not on the original Contract Drawings.
 - j. Field records for variable and concealed conditions.
 - k. Record information on the Work that is shown only schematically.
 - 3. Mark the Contract Drawings completely and accurately.
 - 4. Mark record set with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 - 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 CLOSEOUT DOCUMENTATION

- A. Organization of Closeout Documents. Each item shall be indexed with tabs as indicated below in a 3-ring binder, three completed copies (one containing original warranties), and three (3) flash drives containing a digital copy, shall be supplied to the Owner. Documents shall be organized and shall include but are not limited to the following:
 - 1. General [Tab1]
 - 1.0 Index
 - 1.1 Affidavits
 - a. Non-Influence
 - b. Statutory
 - 1.2 Lien Waivers (Contractor and Subcontractors)
 - 1.3 Consent of Surety for Final Payment
 - 1.4 Contractor's Warranty
 - 1.5 Certificate of Completion

- 1.6 List of major subcontractors with contact name, address and phone numbers.
 2. Refer to Section 01 33 00 "Submittals" for additional submittals and warranties.
 3. Refer to each specification section for Close-Out and O & M information.
 4. Final payment will not be processed or reviewed by Architect until **all** Closeout Documents and Operations and Maintenance manuals are completed.
- B. The balance of the warranties, operations and maintenance material shall be divided into manageable sections and binders. See Section 01 33 00 "Submittals".

2.3 OPERATIONS AND MAINTENANCE MANUAL

- A. Submit two copies of each manual. Label and index each manual. Include project title and date of submittal.
1. Use heavy duty 3-ring binders to accommodate data. Provide protective sleeves for loose and odd sized manufacturer's information.
 2. Divide manuals into major categories, Divisions **1 - 33** per specification section:
 - a. One tab per applicable division – see Table of Contents
- B. Include all required warranties and manufacturers data as required per each section of the specification.
1. Contractor shall review specification, log and track the necessary warranties.
 2. Architect will review submittal log with Owner for completeness.
 3. Include procedures to follow and required notifications for warranty claims.
- C. Include copies of transmittals for required materials.
- D. Include maintenance procedures for installed products.
1. Inspection procedures.
 2. Types of cleaning agents to be used and method of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Provide schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. In addition, contractor is to provide (3) flash drives of scanned documents in PDF format.

END OF SECTION

DIVISION 5 – METAL FABRICATIONS
SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 – GENERAL

1.1 SUMMARY

- A. Cold-formed metal framing for walls.

1.2 RELATED SECTIONS

- A. Section 07 21 00 “Thermal and Acoustical Insulation”
- B. Section 09 29 00 “Gypsum Board Assemblies”

1.3 REFERENCES

- A. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- B. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- C. ASTM B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- D. ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
- E. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- F. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
- G. AISI S200-12 – Standard for Cold-Formed Steel Framing General Provisions.
- H. AISI S100-12- Specification for the Design of Cold-Formed Steel Structural Members.
- I. AWS D.1.3 - Structural Welding Code - Sheet Steel.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 “Submittals”
- B. Product Data: Submit manufacturer’s product literature, data sheets and installation recommendations for specified products.
- C. Structural Calculations: Submit structural calculations prepared by manufacturer for approval. Submittal shall be sealed by a professional engineer registered in the state of the project.
 - 1. Description of design criteria.
 - 2. Engineering analysis depicting stress and deflection (stiffness) requirements for each framing application.
 - 3. Selection of framing components, accessories and welded connection requirements.
 - 4. Verification of attachments to structure and adjacent framing components.
 - 5. Engineer shall have a minimum of 5 years experience with projects of similar scope.

- D. Shop Drawings:
1. Submit shop drawings prepared by the manufacturer showing plans, sections, elevations, layouts, profiles and product component locations, including anchorage, bracing, fasteners, accessories and finishes.
 2. Show connection details with screw types and locations, weld lengths and locations, and other fastener requirements.
 3. Where prefabricated or pre-finished panels are to be provided, provide drawings depicting panel configurations, dimensions and locations.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
- B. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Store materials protected from exposure to rain, snow or other harmful weather conditions, at temperature and humidity conditions per the recommendations of ASTM C955.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: ClarkDietrich; 9050 Centre Point Dr. Suite 400 Westchester, OH 45069. Tel: (513) 870-1100. Fax: (513) 870-1300. Website: www.clarkdietrich.com
1. Dietrich Metal Framing; 330 Greenwood Place, McDonough, GA (678) 304-5500
- B. Other manufacturers as approved equal.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 33 00 "Submittals".

2.2 COMPONENTS

- A. Studs: Cold-formed galvanized steel C-studs; Dietrich Big "D" Steel C-Studs or approved equal:
1. Size: 1-3/8 inch (35 mm) flange width, 3/8 inch (9.5 mm) returns, and web depth as indicated on drawings; Series CWN.
 2. Size: 1-5/8 inch (41 mm) flange width, 1/2 inch (12.7 mm) returns, and web depth as indicated on drawings; Series CSJ.
 3. Size: 2 inches (51 mm) flange width, 5/8 inch (15.9 mm) returns, and web depth as indicated on drawings; Series CSW.
 4. Size: 2-1/2 inch (64 mm) flange width, 5/8 inch (15.9 mm) returns, and web depth as indicated on drawings; Series CSE.
 5. Size: 3 inch (76 mm) flange width, 1 inch (25.4 mm) returns, and web depth as indicated on drawings; Series CSS.
 6. Sizes: As indicated on drawings.
 7. Minimum Yield Strength: 33 ksi (227 MPa) (for 20 through 12 gauges only).
 8. Minimum Yield Strength: 50 ksi (345 MPa) (optional for 16 gauge and heavier).

9. Minimum Yield Strength: As required for design.
 10. Minimum Delivered Thickness: 20 gauge, 0.0329 inch (0.84 mm).
 11. Minimum Delivered Thickness: 18 gauge, 0.0428 inch (1.09 mm).
 12. Minimum Delivered Thickness: 16 gauge, 0.0538 inch (1.37 mm).
 13. Minimum Delivered Thickness: 14 gauge, 0.0677 inch (1.72 mm).
 14. Minimum Delivered Thickness: 12 gauge, 0.0966 inch (2.45 mm).
- B. Runner Track: Cold-formed galvanized steel; Dietrich Big “D” Structural Runner Track or approved equal:
1. Designation: TSB Standard Leg 1 1/4 inches (32 mm) high.
 2. Designation: Equal Leg.
 3. Designation: Unequal Leg.
 4. Designation: Custom size up to 3 inches (76.2 mm) high.
 5. Designation: Slip Track (SLP-TRK®)
 6. Minimum Yield Strength: 33 ksi (227 MPa) (for 20 through 12 gauges only).
 7. Minimum Yield Strength: 50 ksi (345 MPa) (for custom order only).
 8. Minimum Yield Strength: As required for design.
 9. Minimum Yield Strength: As required for design.
 10. Material thickness to match stud/joist thickness unless design dictates heavier thickness.
- C. Sliptrack Systems – Slotted Deflection Track:
1. Standard leg of 2 1/2 inches.
 2. Standard vertical slot of 1 1/2 inches in leg.
 3. Fast Top Clip: Minimum Delivered Thickness: 14 gauge, 0.0677 inch (1.72 mm)
 4. Minimum yield strength of 33 k.s.i. in 18 gauge and lighter
 5. Minimum yield strength of 50 k.s.i. in 16 gauge and heavier.
- D. Deflection Clips:
1. Slide Clips: Minimum Delivered Thickness: 14 gauge, 0.0677 inch (1.72 mm).
 2. Slide Clips: Minimum Delivered Thickness: 12 gauge, 0.0966 inch (2.45 mm).
 3. Fast Top Clip: Minimum Delivered Thickness: 14 gauge, 0.0677 inch (1.72 mm)
 4. Fast Strut Clip: Minimum Delivered Thickness: 14 gauge, 0.0677 inch (1.72 mm)
 5. Fast ClipSlide Clip: Minimum Delivered Thickness: 14 gauge, 0.0677 inch (1.72 mm)
 6. QuickClip: Minimum Delivered Thickness: 10 gauge, 0.1180 inch (3 mm)
- E. Clip Angles (Support Clips) EasyClip® Series or approved equal: Minimum Delivered Thickness: 16 gauge, 0.0538 inch (1.37 mm); 14 gauge, 0.0677 inch (1.72 mm); 12 gauge, 0.0966 inch (2.45 mm).
1. EasyClip® A Series or approved equal:
 - a. Size: 3 by 3 by 3 inches (76.2 by 76.2 by 76.2 mm)
 - b. Size: 3 by 3 by 6 inches (76.2 by 76.2 by 152 mm)
 2. EasyClip® U Series or approved equal:
 - a. Size: 1-1/2 by 1-1/2 by 3-3/8 inches (38.1 by 38.1 by 85.7 mm)
 - b. Size: 1-1/2 by 1-1/2 by 5-3/4 inches (38.1 by 38.1 by 146 mm)
 - c. Size: 1-1/2 by 1-1/2 by 7-3/4 inches (38.1 by 38.1 by 197 mm)
 - d. Size: 1-1/2 by 1-1/2 by 9-3/4 inches (38.1 by 38.1 by 248 mm)
 3. EasyClip® B Series or approved equal:
 - a. Size: 1-1/2 by 1-1/2 by 3 inches (38.1 by 38.1 by 76.2 mm)
 - b. Size: 1-1/2 by 1-1/2 by 5-1/4 inches (38.1 by 38.1 by 133 mm)
 - c. Size: 1-1/2 by 1-1/2 by 7-1/4 inches (38.1 by 38.1 by 184 mm)
 - d. Size: 1-1/2 by 1-1/2 by 9-1/4 inches (38.1 by 38.1 by 235 mm)
 4. EasyClip® X Series or approved equal:
 - a. Size: 2 by 2 by 3-3/8 inches (50.8 by 50.8 by 85.7 mm)
 - b. Size: 2 by 2 by 5-3/4 inches (50.8 by 50.8 by 146.0 mm)
 - c. Size: 2 by 2 by 7-3/4 inches (50.8 by 50.8 by 196.8 mm)
 - d. Size: 2 by 2 by 9-3/4 inches (50.8 by 50.8 by 247.6 mm)
 5. EasyClip® S Series or approved equal:
 - a. Size: 1-1/2 by 1-1/2 by 3 inches (38.1 by 38.1 by 76.2 mm)
 - b. Size: 1-1/2 by 1-1/2 by 5 inches (38.1 by 38.1 by 127 mm)
 - c. Size: 1-1/2 by 1-1/2 by 7 inches (38.1 by 38.1 by 178 mm)

- d. Size: 1-1/2 by 1-1/2 by 9 inches (38.1 by 38.1 by 229 mm)
- e. Size: 1-1/2 by 1-1/2 by 11 inches (38.1 by 38.1 by 279 mm)
- 6. EasyClip® E Series or approved equal:
 - a. Size: 4 by 1-1/2 by 3 inches (101 by 38.1 by 76.2 mm)
 - b. Size: 4 by 1-1/2 by 5 inches (101 by 38.1 by 127 mm)
 - c. Size: 4 by 1-1/2 by 7 inches (101 by 38.1 by 178 mm)
 - d. Size: 4 by 1-1/2 by 9 inches (101 by 38.1 by 229 mm)
 - e. Size: 4 by 1-1/2 by 11 inches (101 by 38.1 by 279 mm)
- F. U-Channel:
 - 1. Size: 3/4 inches (19.1 mm).
 - 2. Size: 1-1/2 inches (38.1 mm).
 - 3. Size: 2 inches (51 mm).
 - 4. Length: Manufacturer's standard length.
 - 5. Minimum Delivered Thickness: 16 gauge, 0.0538 inch (1.37 mm)
- G. Bridging/Spacer Bar: Dietrich TradeReady® Spazzer® or approved equal: 5400 Bridging and Bracing Bar.
 - 1. Minimum Delivered Thickness: 16 gauge, 0.0538 inch (1.37 mm).
 - 2. 1-1/4 by 1-1/4 by 50 inches (32 by 32 by 1270 mm) long pre-notched at 12, 16 and 24 inch (305 by 406 by 610 mm) centers.
 - 3. Dietrich TradeReady® Spazzer® Bar Guard or approved equal: Minimum Delivered Thickness: 20 gauge, 0.0329 inch (0.84 mm)
- H. Web Stiffeners:
 - 1. Width: 4 inches (102 mm). Minimum Delivered Thickness: 14 gauge, 0.0677 inch (1.72 mm)
 - 2. Length: As shown on drawings.
 - 3. Web Stiffener – 2 piece - Minimum Delivered Thickness: 14 gauge 0.0677 inch (1.72 mm)
- I. Floor Joists: Cold-formed Galvanized Steel C-Joist, Dietrich TradeReady® Floor System or approved equal:
 - 1. Size: 7-1/4 inches (184 mm) deep, with 1-3/4 inches (45 mm) flange, and 4-1/4 by 7 inches (108 by 178 mm) oval holes.
 - 2. Size: 8 inches (203 mm) deep, with 1-3/4 inches (45 mm) flange, and 4-1/4 by 7 inches (108 by 178 mm) oval holes.
 - 3. Size: 9-1/4 inches (235 mm) deep, with 1-3/4 inches (45 mm) flange, and 6-1/4 by 9 inches (159 by 229 mm) oval holes.
 - 4. Size: 10 inches (254 mm) deep, with 2 inches (51 mm) flange and 6-1/4 by 9 inches (159 by 229 mm) oval holes.
 - 5. Size: 11-1/4 inches (286 mm) deep, with 1-3/4 inches (45 mm) flange, and 8 inches (203 mm) diameter round holes.
 - 6. Size: 12 inches (305 mm) deep, with 2 inches (51 mm) flange, and 8 inches (203 mm) diameter round holes.
 - 7. Size: 14 inches (356 mm) deep, with 2 inches (51 mm) flange, and 10 inches (254 mm) diameter round holes.
- J. Load-Bearing Headers:
 - 1. Dietrich TradeReady® Load-Bearing Header or approved equal (Cold-formed galvanized one-piece load-bearing header).
 - a. Size: 3-7/8 inches (98 mm) wide with 8 inch (203 mm) legs.
 - b. Size: 3-7/8 inches (98 mm) wide with 12 inch (305 mm) legs.
 - c. Size: 6-1/4 inches (159 mm) wide with 8 inch (203 mm) legs.
 - d. Size: 6-1/4 inches (159 mm) wide with 12 inch (305 mm) legs.
 - e. Minimum Delivered Thickness: 14 gauge, 0.0677 inch (1.72 mm), minimum.
 - 2. Dietrich L-Header or approved equal (Cold-formed galvanized one-piece load-bearing header)
 - a. Size: 1-1/2 inches by 6 inches, manufactured in 18 gauge (0.0428), 16 gauge (0.0538) and 14 gauge (0.0677)

- b. Size: 1-1/2 inches by 8 inches, manufactured in 18 gauge (0.0428), 16 gauge (0.0538) and 14 gauge (0.0677)
 - c. Size: 1-1/2 inches by 10 inches, manufactured in 18 gauge (0.0428), 16 gauge (0.0538) and 14 gauge (0.0677)
- K. Framing Component Accessories: Provide the following accessories as required for a complete system.
- 1. Flat Strapping.
 - 2. Angles, Plates, Sheets.
 - 3. Custom Brake-Formed Shapes.
- L. Fasteners: Self-drilling, self-tapping screws; Steel, complying with ASTM C1513; Galvanized coating, plated or oil-phosphate coated complying with ASTM B 633 as needed for required corrosion resistance.
- M. Touch-Up Paint: Zinc rich, containing 95-percent metallic zinc, ZRC 350 as manufactured by ZRC Worldwide, Marshfield, MA. or approved equal.

2.3 MATERIALS

- A. Cold-Formed Steel: Complying with ASTM A 1003/A 1003M; unless indicated otherwise.
- B. Galvanized Coating: G60 coating weight minimum, complying with ASTM C 955.
- C. Galvanized Coating: G90 coating weight minimum, complying with ASTM C 955.

2.4 FABRICATION

- A. General: Framing components may be pre-assembled into panels prior to erecting.
- B. Fabricate panels square, with components attached in a manner so as to prevent racking or distortion.
- C. Cut all framing components squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Hold members positively in place until properly fastened.
- D. Provide insulation as specified elsewhere in all double jamb studs and double header members, which will not be accessible to the insulation contractor.
- E. Axially Loaded Studs:
 - 1. Install studs to have full bearing against inside track web (1/8 inches (3.2 mm) maximum gap) prior to stud and track attachment.
 - 2. Splices in axially loaded studs are not permitted.
- F. Fasteners: Fasten components using self-tapping screws or welding.
- G. Welding: Welding is permitted on 18 gauge or heavier material only.
 - 1. Specify welding configuration and size on the Structural Calculation submittal.
 - 2. Qualify welding operators in accordance with Section 6.0 of AWS D.1.3.
 - 3. Touch up all welds with zinc-rich paint in compliance with ASTM A 780.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Prior to installation, inspect previous work of all other trades. Verify that all work is complete and accurate to the point where this installation may properly proceed in strict accordance with framing shop drawings.

- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 ERECTION

- A. General Erection Requirements:
 - 1. Install cold-formed framing in accordance with requirements of ASTM C1007.
 - 2. Weld in compliance with AWS D.1.3.
 - 3. Install in compliance with applicable sections of the AISI Standard for Cold-Formed Steel Framing General Provisions.
- B. Wall Systems:
 - 1. Erect framing and panels plumb, level and square in strict accordance with approved shop drawings.
 - 2. Handle and lift prefabricated panels in a manner so as not to cause distortion in any member.
 - 3. Anchor runner track securely to the supporting structure as shown on the erection drawings. Install concrete anchors only after full compressive strength has been achieved. Provide a sill sealer or gasket barrier between all concrete and steel connections.
 - 4. Butt all track joints. Securely anchor abutting pieces of track to a common structural element, or butt-weld or splice them together.
 - 5. Align and plumb studs, and securely attach to the flanges or webs of both upper and lower tracks except when vertical movement is specified.
 - 6. Install jack studs or cripples below window sills, above window and door heads, at freestanding stair rails and elsewhere to furnish support, securely attached to supporting members.
 - 7. Attach wall stud bridging in a manner to prevent stud rotation. Space bridging rows according to manufacturer's recommendations.
 - 8. Frame wall openings to include headers and supporting studs as shown in the drawings.
 - 9. Provide temporary bracing until erection is completed.
 - 10. Provide stud walls at locations indicated on plans as "shear walls" for frame stability and lateral load resistance.
 - 11. Where indicated in the drawings, provide for structural vertical movement using a vertical slide clip or other means in accordance with manufacturer's recommendations.
- C. Steel Joists:
 - 1. Locate joists directly over bearing studs within ¾" or provide a suitable load distribution member at the top track.
 - 2. Provide web stiffeners at reaction points where indicated in drawings.
 - 3. Provide joist bridging as shown in drawings.
 - 4. Provide end blocking where joist ends are not otherwise restrained from rotation.

3.3 FIELD QUALITY CONTROL

- A. Inspection: Periodic special inspections are required by local code authorities.
 - 1. Owner will hire and pay inspection agency.
 - 2. Submit schedule showing when the following activities will be performed and resubmit schedule when timing changes.
 - 3. Notify inspection agency not less than 3 days before the start of any of the following activities.
 - 4. Inspections are required during welding operations, screw attachment, bolting, anchoring and other fastening of components within the force resisting structural system, including struts, braces, and hold-downs.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

DIVISION 5 - METALS
SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS AND WORK

- A. The Division 1 General Requirements, Specifications, Drawings, Addenda, and Modifications are binding on all work for this Project.

1.2 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the provisions of the following codes, standards and specifications, except as otherwise shown and specified:
1. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
ANSI A10.3 (Safety Requirements for Powder-Actuated Fastening Systems)
 2. AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
ASME B18.2.6 Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)
ASME B18.6.2 Slotted Head Cap Screws, Square Head Set Screws and Slotted Headless Set Screws
ASME B18.6.3 Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series)
ASME B18.21.1 Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)
 2. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
ASTM A36 Carbon Structural Steel
ASTM A47 Ferritic Malleable Iron Castings
ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A167 Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip (Withdrawn 2014)
ASTM A500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A780 Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

1.3 SUBMITTALS

- A. Submit manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions for products to be used in miscellaneous metal work.

1.4 COOPERATION

- A. Work of this section shall be fitted to work of all other applicable sections and coordinated to best advantage of entire job. Do all required cutting, drilling, fitting and tapping for securing work in position to accommodate work of other sections. Items fabricated for support of items installed by other sections shall be shop painted as specified herein.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel shall be as per ASTM A36, ASTM A440, ASTM A283, ASTM A306 (as applicable).
- B. Cast steel shall be as per ASTM A27, ASTM A148, (as applicable).
- C. Steel forgings shall be as per ASTM A235, ASTM A237, (as applicable).
- D. Bolts and fasteners shall be as per ASTM A307, ASTM A325, ASTM A354, (as applicable).

- E. Cold Rolled Carbon Steel Sheets: ASTM A366.
- F. Paint for metal primer shop coats shall be approved type primer (See Section 09 91 00 - "Painting")
 - 1. Primer paint selected must be fully compatible with the required finish coats of paint specified. Coordinate selection of metal primer with finish paint requirements.
 - 2. Galvanizing Repair and Primer Paint: Zinc dust, zinc oxide, alkyd paint conforming to FS TT-P-641G, Type II.

2.2 FASTENERS

- A. Select fasteners for the type, grade and class required for the installation of miscellaneous metal items.
- B. Standard Bolts and Nuts: ASTM A307, Grade A, regular hexagon head.
- C. Lag Bolts: FS FF-B-561C, square head type.
- D. Machine Screws: FS FF-S-92B, cadmium plated steel.
- E. Wood Screws: FS FF-S111D, flat head carbon steel.
- F. Plain Washers: FS FF-W-92B, round, general assembly grade carbon steel.
- G. Lock Washers: FS FF-W84G, helical spring type carbon steel.
- H. Masonry Anchorage Devices: Expansion shields, FS FF-S-325-57.

PART 3 - EXECUTION

3.1 SHOP PAINTING

- A. Ferrous metals shall be cleaned of rust, scale, dirt and shall be given shop coats of approved zinc chromate primer or red oxide as specified under "Materials".
- B. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 "Hand Tool Cleaning" or SSPC SP-3-63 "Power Tool Cleaning" or SSPC SP-7-63 "Brush-Off Blast Cleaning". Remove oil areas and similar contaminants in accordance with SSPC SP-1-63 "Solvent Cleaning".
 - 1. Immediately after the surface preparation, brush or spray on metal primer paint, applied in accordance with the manufacturer's instructions and at a rate to provide a uniform dry film thickness of 2.0 mils for each coat. Use painting methods which will result in full coverage of joints, corners, edges and all exposed surfaces.
- C. Apply a bituminous coating of approximately 30 mil dry film thickness or other suitable permanent separator, on concealed contact surfaces of dissimilar materials before assembly or installation wherever there is the possibility of corrosive or electrolytic action.

3.2 FABRICATION

- A. Use materials of the size and thicknesses indicated or if not indicated, of the required size and thickness to produce adequate strength and durability in finished product for the intended use.
 - 1. Provide for anchorage of the type shown, coordinated with the supporting structure and the progress schedule.
 - 2. Cut, reinforce, drill and tap miscellaneous metal work indicated to receive finish hardware and similar items of work.

3.3 WORKMANSHIP AND INSTALLATION

- A. All miscellaneous metal items shall be accurately fabricated and erected with exposed joints close fitted. Joints shall be of such character, so assembled that they will be as strong and rigid as adjoining sections. Joints shall be located where least conspicuous.

- B. Members to be built in with masonry or concrete shall be in form affording suitable anchorage or shall be provided with approved anchors or other approved means of securing members.
- C. Threaded connections shall be made up tight so that threads will be entirely concealed. Projecting bolts shall be cut off flush with nuts where they are exposed or where they would interface with other work.
- D. Fasteners shall be of compatible metal to metal item secured.
- E. Do necessary cutting, drilling, fitting as required for installation of miscellaneous metal work. Work shall be carefully done, and when required, shall be fitted at building before finishing.
- F. Ferrous and non-ferrous metals shall be insulated at contacts with felt washers, strips or sheets, bitumastic paints or other approved means.
- G. Where aluminum is in contact with cement mortar, concrete or masonry, contacting surfaces shall be coated with an approved asphaltic paint.
- H. Provide loose plates, hangers, brackets, sleeves, anchors and bolts as required to complete work provided under other sections. Employ only mechanics skilled in work specified herein.
- I. Provide required fastening, hangers, anchor brackets, lugs sleeves, straps, bolts, similar items required to set, connect and secure work.
- J. Except where otherwise indicated and specified for particular item of work or where work is required to be built in, fasten to masonry with approved type fastenings. Fastening to wood plugs set in masonry will not be permitted.
- K. Defective work whether in materials, fabrication, installation or workmanship shall be rejected. Remove and replace such rejected work at no extra cost.

END OF SECTION

DIVISION 6 - CARPENTRY
SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Wood framing, furring, grounds, nailers, and blocking.
 - 2. Framing with Fire Treated wood products.

1.2 DEFINITIONS

- A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Section 01 33 00 "Submittals".
- B. Product Data for the following products:
 - 1. Pressure Treated wood products.
 - 2. Fire Treated wood products.
- C. Material certificates for dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee's (ALSC) Board of Review.
- D. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:
 - 1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
 - 2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
- E. Warranty of chemical treatment manufacturer for each type of treatment.
- F. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence the following products' compliance with building code in effect for Project:
 - 1. Engineered wood products.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for engineered wood products: Obtain each type of engineered wood product from one source and by a single producer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

1.6 WARRANTY

- A. Construction Warranty: FAR Clause 52.246-21, "Warranty of Construction"

1.7 PRE-INSTALLATION MEETINGS

- A. Preinstallation Conference: Contractor to schedule conference at Project site.
 - 1. Review special inspection and testing and inspecting agency procedures for field quality control, and concrete protection.
 - 2. Meeting is to occur minimum of 2 weeks prior to installation. Owner, Architect & Manufacturer's Representative to attend.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wood-Preservative-Treated Materials:
 - a. Baxter: J. H. Baxter Co.
 - b. Chemical Specialties, Inc.
 - c. Continental Wood Preservers, Inc.
 - d. Hickson Corp. (Now "Dricon", owned by Lonza)
 - e. Hoover Treated Wood Products, Inc.
 - f. Osmose Wood Preserving, Inc.
 - 2. Metal Framing Anchors:
 - a. Alpine Engineered Products, Inc.
 - b. Cleveland Steel Specialty Co.
 - c. Harlen Metal Products, Inc.
 - d. KC Metals Products, Inc.
 - e. Silver Metal Products, Inc.
 - f. Simpson Strong-Tie Company, Inc.
 - g. Southeastern Metals Manufacturing Co., Inc.
 - h. United Steel Products Company, Inc.

2.2 LUMBER, GENERAL

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
 - 1. Grade of lumber: Structural Select.
 - 2. Species: White fir or southern yellow pine.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
 - 1. Do not use chemicals containing chromium or arsenic.
- B. Pressure treat above ground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood blocking, and similar concealed members in contact with masonry or concrete.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

- C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
- D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
- B. Power-Driven Fasteners: CABO NER-272.
- C. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M)
- D. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.6 METAL FRAMING ANCHORS

- A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:
 - 1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
 - 2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
- C. Joist Hangers: U-shaped joist hangers with 2-inch-(50-mm-) long seat and 1-1/4-inch-(32-mm-) wide nailing flanges at least 85 percent of joist depth.
 - 1. Thickness: [0.050 inch (1.3 mm)]
- D. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

2.7 FIRE TREATED WOOD

- A. General: Where fire-retardant-treated wood is indicated, comply with applicable requirements of AWWA C20 (lumber) and AWWA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL; U.S. Testing; Timber Products Inspection, Inc.; or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Research or Evaluation Reports: Provide fire-retardant-treated wood acceptable to State Fire Marshal and for which a current model code research or evaluation report exists that evidences compliance of fire-retardant-treated wood for application indicated.
- B. Interior Type A: For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:
 - 1. Bending strength, stiffness, and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity

- conditions simulating installed conditions when tested by a qualified independent testing agency.
 - 2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.
 - 3. Contact with treated wood does not promote corrosion of metal fasteners.
- C. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- C. Apply field treatment complying with AWWA M4 to cut surfaces of preservative-treated lumber and plywood.
- D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule" in ICC's International Building Code (IBC)
 - 2. ICC-ES evaluation report for fastener.
- E. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.
- F. Use hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.

3.2 WOOD FRAMING INSTALLATION, GENERAL

- A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Do not splice structural members between supports.

3.3 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

- A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

END OF SECTION

DIVISION 7 - THERMAL & MOISTURE PROTECTION
SECTION 07 21 00 – THERMAL AND ACOUSTIC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Sound attenuation in stud walls.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 09 29 00 “Gypsum Board Assemblies” indicated below for insulation installed as part of metal-framed wall and partition assemblies.

1.2 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of insulation product specified.
- C. Product test reports from and based on tests performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.

1.3 QUALITY ASSURANCE

- A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation
- B. Protect plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.5 WARRANTY

- A. Manufacturer warranty to cover product from date of installation to life of the building. Warranty to provide replacement of non-performing material, assuming product was installed properly. See manufacture’s written warranty for complete details.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering insulation products that may be incorporated in the work include, but are not limited to, the following:
 - 1. Extruded Board Insulation:
 - a. Amoco Foam Products Company.
 - b. DiversiFoam Products.
 - c. Dow Chemical Co.
 - d. UC Industries, Inc.; Owens-Corning Co.
 - e. CertainTeed Corporation.
 - f. Owens-Corning Fiberglas Corporation.
 - g. Johns Manville Corporation (JM)

2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
 - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Unfaced Mineral-Fiber Blanket Insulation: Sound attenuation insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type I (blankets without membrane facing for stud walls and ceilings).
 - 1. Mineral-Fiber Type: Fibers manufactured from glass, slag wool, or rock wool.
 - 2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
 - 3. 2" thickness.
- C. Sound attenuation batts: 2" thermofiber batt for stud wall cavity. (All stud walls)

2.3 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulations or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
 - 1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3.5 PROTECTION

- A. General: Protect installed insulation from physical abuse and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

DIVISION 7 - THERMAL & MOISTURE PROTECTION
SECTION 07 84 00 - FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes firestopping for the following:
 - 1. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 2. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
 - 3. Sealant joints in fire-resistance-rated and smoke-resistive construction.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 07 92 00 "Joint Sealants & Gasketing" for non-fire-resistive-rated joint sealants.
 - 2. Division 23 sections specifying ducts and piping penetrations.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases. Work shall be performed by a single subcontractor for all firestopping systems. Installer shall be "Certified" and "Trained" by the material manufacturer.
- B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings as determined per ASTM E 814, not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupied floor areas. T-rated assemblies are required where the following conditions exist:
 - 1. Where firestop systems protect penetrations located outside of wall cavities.
 - 2. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.
 - 3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
 - 4. Where firestop systems protect penetrating items larger than a 4-inch-diameter nominal pipe or 16 sq. in. in overall cross-sectional area.
- D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- F. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

1.3 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

- B. Product data for each type of product specified.
 - 1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.
- C. Shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
 - 2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration approved by firestopping manufacturer's fire protection engineer with modifications marked.
- D. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements. Provide certificates of Installer's training by the received from the firestopping material manufacturer.
- E. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.
- F. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.
 - 3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements:
 - a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
 - b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.
- B. Installer Qualifications: Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements.

- C. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
- D. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."
- E. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.
- B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

1.7 SEQUENCING AND SCHEDULING

- A. Do not cover up those firestopping installations that will become concealed behind other construction until Architect and authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

- A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
- B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
 - 1. Permanent forming/damming/backing materials including the following:
 - a. Semi-refractory fiber (mineral wool) insulation.
 - b. Ceramic fiber.
 - c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
 - d. Joint fillers for joint sealants.
 - 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.
- C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.2 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

- A. Ceramic-Fiber and Mastic Coating: Ceramic fibers in bulk form formulated for use with mastic coating, and ceramic fiber manufacturer's mastic coating.
- B. Ceramic-Fiber Sealant: Single-component formulation of ceramic fibers and inorganic binders.
- C. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.
- D. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.
- E. Intumescent Putty: Nonhardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.
- G. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.
- H. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogenous mortar.
- I. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- J. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.
- K. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/ gunnable sealant, unless indicated firestop system limits use to non-sag grade for both opening conditions.
 - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) grade for openings in floors and other horizontal surfaces.
 - 3. Grade for Vertical Surfaces: Non-sag grade for openings in vertical and other surfaces.
- L. Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer-based sealant of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/ gunnable sealant, unless indicated firestop system limits use to non-sag grade for both opening conditions.
 - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) grade for openings in floors and other horizontal surfaces.
 - 3. Grade for Vertical Surfaces: Non-sag grade for openings in vertical and other surfaces.
- M. Products: Subject to compliance with requirements, provide fire stopping systems from:
 - 1. **Hilti Construction Chemicals, Inc.** (866) 445-8827
5400 South 122nd East Avenue
Tulsa, OK 74146

2.3 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

- B. Sealant Colors: Provide color of exposed joint sealants to comply with the following:
 - 1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.
- C. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, & joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.
 - 1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage changes in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
 - a. 50% movement in both extension & compression for a total of 100% movement.
- D. Multicomponent, Non-sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.
 - 1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage change in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
 - a. 40% movement in extension & 25% in compression for a total of 65% movement.
 - b. 50% movement in both extension & compression for a total of 100% movement.

2.4 MIXING

- A. Those products requiring mixing prior to application, comply w/firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
 - 1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
 - 2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form release agents from concrete.
- B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestop seal with substrates.

3.3 INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to

products and applications indicated.

- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
 - 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

- A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begin. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.5 LABELING

- A. Label both sides of all fire rated walls above ceiling to identify fire "Time Rating" of wall assembly. Self-adhered lettering is not acceptable, conform to Section 09 91 00, "Painting". Conform with NFPA 101 L/S Code & IBC 2018 with Georgia Amendments. Reference paragraph 703.7 Marking and Identification: Where there is an accessible concealed floor, floor-ceiling or attic space, fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling in the concealed space.
- B. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
 - 1. The words: "Warning: Through Penetration Firestop System – Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address and phone number.
 - 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Through-penetration firestop system manufacturer's name.
 - 6. Installer's name.

- C. A firestop documentation manager software shall be used to document, track, and maintain the passive firestop systems throughout the construction and maintenance phase of the facility. The software solution shall be used to track and document every firestop system installed on the project and each subsequent addition, change, or removal of the firestop system. The firestop documentation shall be managed with a cloud-based software which allows the installer to use a standard smartphone or tablet device (either iOS, Android or Windows capable) to capture the relevant information for the installation. The following data shall be tracked for each penetration within the facility: product installed, system installed, date of installation, location of the penetration including a notation on the 2D plan image, F-rating, name of installer, photo (pre-installation and post-installation), and inspection status. The Owner and/ or Construction Manager may designate additional items to be tracked. The firestop documentation manager software must perform the following basic functions:
1. Create multiple projects/ facilities, add/create/ remove users for each project, upload documents including UL systems, 2D floor plans, product data, engineering judgments, etc.
 2. Define data to track using pre-defined input fields or creating custom input fields as desired.
 3. Capture multiple photos for each penetration, including a pre-installation and post-installation photo.
 4. Scan QR Code on Hilti identification label to link the program data to a specific penetration location.
 5. Annotate (mark) location of penetration on 2D floor plan.
 6. Create reports by filtering data and utilizing report templates.
 7. Online/ offline (for use in areas where data service is unavailable) synchronization of data between mobile device, online application and cloud-based system.
 8. Ability to transfer ownership of projects from one customer to another from construction phase to facility maintenance.
- D. Permanently attach Hilti identification labels to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove or change penetrating items or firestopping. Labels shall have a unique QR code for each penetration which can be scanned by the firestop documentation software to quickly identify the penetration attributes.
1. Acceptable Software: Hilti CFS-DM, from Hilti Inc., Plano, TX. Tel (800) 879-8000 or Hilti (Canada) Corporation, Mississauga, Ontario (800) 363-4458 website: www.us.hilti.com or www.hilti.ca.com
 2. Substitutions: Not permitted.
 3. Single Source: Obtain firestop documentation manager software and firestop systems for each type of penetration and construction condition indicated only from a single manufacturer.

3.6 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
- B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

END OF SECTION

DIVISION 7 – THERMAL & MOISTURE PROTECTION
SECTION 07 92 00 – JOINT SEALANTS & GASKETING

PART 1 – GENERAL

1.1 SUMMARY

- A. This section consists of furnishing of all labor, materials, equipment and related items for all sealants and caulking, as indicated on the drawings or specified herein.
- B. Required applications of sealants include, but are not necessarily limited to, the following general locations:
 - 1. Joints between different materials.
 - 2. Perimeter joints between materials and frames of doors.
 - 3. Control joints on exposed interior surfaces of exterior walls.
 - 4. Perimeter joints between interior wall surfaces and frames of interior doors.
 - 5. Joints between adjoining construction & different materials.
 - 6. All sealant work not specifically mentioned in other sections, but required to provide a neat appearance and weathertight construction.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 “Submittals”:
 - 1. Manufacturer's Data: Submit manufacturer's name, specifications, recommendations and installation instructions for each type of sealant, caulking compound and associated material required.
 - 2. Include manufacturer's published data, or letter of certification, or certified test laboratory report indicating that each material complies with the requirements and is intended generally for the applications shown.
 - 3. Samples, Sealants and Caulking: Submit 3, 12" long samples of each color required (except black) for each type of sealant or caulking compound exposed to view. Install sample between 2 strips of material similar to or representative of typical surfaces where sealant or compound will be used, held apart to represent typical joint widths. Samples will be reviewed by Architect for color and texture only. Compliance with other requirements is the exclusive responsibility of the Contractor.
 - 4. Color Samples. Submit manufacturer's standard palette of caulking and sealant colors for selection by the Architect. Sealant shall match adjacent material.

1.3 PRODUCT DELIVERY

- A. Deliver materials to the site in unbroken containers.

1.4 QUALITY ASSURANCE

- A. Obtain elastomeric sealant materials from manufacturers who will, if required, send a qualified technical representative to project site, for the purpose of advising the Installer of proper procedures and precautions for the use of the materials.
- B. Installer: A firm with a minimum of five (5) years successful experience in the application of the types of materials required.

1.5 JOB CONDITIONS

- A. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

- B. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.
- C. Inspection: The Installer must examine the joint surfaces, backing, and anchorage of units forming sealant rabbet, and the conditions under which the sealant work is to be performed, and notify the Contractor in writing of conditions detrimental to proper and timely completion of work and performance of the sealants.
- D. Weather Conditions: Do not proceed with installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended temperature range for installation. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength. Where joint width is affected by ambient temperature variations, install elastomeric sealants only where temperatures are in the lower third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.

1.6 WARRANTY (GUARANTEE)

- A. Sealant Warranty: Provide written warranty, signed by Contractor and Installer; agreeing to, within warranty period, replace/repair defective materials and workmanship defined to include:
 - 1. Instances of significant leakage of water or air.
 - 2. Failures in joint adhesion, material adhesion, abrasion resistance, migration resistance, strain resistance, or general durability.
- B. Warranty includes responsibility for removal and replacement of other work (if any) which conceals or obstructs the replacement of sealants.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

- A. Colors. Colors of caulking and sealant materials will be selected by the Architect.
- B. Compatibility: Before selection and purchase of each specified sealant, investigate its compatibility with the joint surfaces, joint fillers and other materials in the joint system. Provide only materials (manufacturer's recommended variation of the specified materials) which are known to be fully compatible with the actual installation conditions, as shown by manufacturer's published data or certification.

2.2 TWO-COMPONENT ELASTOMERIC SEALANTS

- A. Two-Component Urethane Sealant:
 - 1. Two-part urethane sealant complying with Type II, ASTM C-920 and ASTM D-1850, non sag recommended for exterior vertical expansion and control joints. Primers as recommended by manufacturer.
 - 2. Provide one of the following products:
 - a. Dynatrol II, Pecora Corp.
 - b. Chem-Calk 500, Bostik
 - c. Masterseal NP2, BASF

2.3 ONE COMPONENT ELASTOMERIC SEALANTS

- A. One Component Urethane Sealant: Use at exterior control and expansion joints. ASTM C920, Class 25, Type S, Grade NS. Provide one of the following products:
 - 1. Pecora - Dynatrol II
 - 2. BASF: Masterseal NP 1

3. Sikaflex 1A by Sika
4. Vulkem 921 by Tremco

2.4 LATEX ACRYLIC JOINT SEALANTS

- A. General: Provide manufacturer's standard one-part, nonsag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.
- B. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.
- C. Products: Subject to compliance with requirements, provide one of the following:
 1. Acrylic-Emulsion Sealant:
 - a. "AC-20," Pecora Corp.
 - b. "Dynaflex 230", Dap
 - c. "Tremco Acrylic Latex 834," Tremco, Inc.
 2. Silicone-Emulsion Sealant:
 - a. "Trade Mate Paintable Glazing Sealant," Dow Corning Corp.

2.5 SOLVENT-RELEASE-CURING JOINT SEALANTS.

- A. Acrylic Sealant: Manufacturer's standard one-part, non-sag, solvent-release-curing acrylic terpolymer sealant complying with AAMA 808.3 or FS TT-S-00230 or both, with capability when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage change in joint width existing at time of application and remain adhered to joint substrates indicated for Project without failing cohesively:
 1. 12-1/2 percent movement in both extension and compression for a total of 25 percent.
- B. Butyl Sealant: Manufacturer's standard one-part, non-sag, solvent-release-curing, polymerized butyl sealant complying with ASTM C 1085 and formulated with minimum of 75 percent solids to be non-staining, paintable, and have a tack-free time of 24 hours or less.
- C. Pigmented Narrow Joint Sealant: Manufacturer's standard, solvent-release-curing, pigmented synthetic rubber sealant complying with AAMA 803.3 and formulated for sealing joints 3/16 inch or smaller in width.
- D. Products: Subject to compliance with requirements, provide one of the following:
 1. Acrylic Sealant:
 - a. "60+Unicrylic," Pecora Corp.
 - b. "Mono," Tremco, Inc.
 2. Butyl Sealant:
 - a. "BC-158," Pecora Corp.
 - b. "Sonneborn Multi-Purpose Sealant," Sonneborn Building Products Div., ChemRex, Inc.
 - c. "Tremco Butyl Sealant," Tremco, Inc.

2.6 SILICONE SEALANT

- A. Silicone Emulsion Sealant: Provide product complying with ASTM C834 and, except for weight loss measured per ASTM C 792, with ASTM C920 that accommodates joint movement of not more than 25 percent in both extension and compression for a total of 50 percent.
 1. Silicone sealant Manufacturer's: (Exterior, integral color, grade NS Type S)
 - a. Dow Corning 795.
 - b. Pecora; 865.
 - c. G.E. Silicone; SilPruf NB SCS 9000.
 - d. Tremco; Spectrem 1.

2. Conform to selected sealant manufacturer's recommended system in each application.

2.7 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 1. Open-cell polyurethane foam.
 2. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, non-outgassing in un-ruptured state.
 3. Proprietary, reticulated, closed-cell polymeric foam, non-outgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 gms/cc per ASTM C 1083.
 4. Any material indicated above.
- C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F (-32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

2.8 MISCELLANEOUS MATERIALS

- A. Joint Cleaner. Provide the type of joint cleaning compound recommended by the sealant or caulking compound manufacturer, for the joint surfaces to be cleaned.
- B. Joint Primer/Sealant: Provide the type of joint primer/sealer recommended by the sealant manufacturer, for the joint surfaces to be primed or sealed.
- C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to the substrate or joint filler must be avoided for performance of sealant. Provide self-adhesive tape where applicable.
- D. Sealer Backer Rod: Compressible non-absorptive material as recommended for compatibility with sealant by the sealant manufacturer. Provide size and shape of rod which will control the joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide a highly compressible backer to minimize the possibility of sealant extrusion when joint is compressed.
- E. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
- F. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
- G. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.
- H. Pre-molded joint fillers: Williams Products, Inc.
 1. Backer Rod.
 2. Gasket.
 3. Ceramic filler.

PART 3 – EXECUTION

3.1 SYSTEM SELECTION

- A. Sealant System. Use for all interior work.

3.2 PREPARATORY WORK

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.
- B. Protection. Prior to priming, apply masking tape to adjacent surfaces. Leave masking tape in place until tooling operation is complete.

3.3 JOINT SURFACE PREPARATION

- A. Clean joint surfaces immediately before installation of sealant compound. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond of sealant or caulking compound.
- B. For elastomeric sealants, do not proceed with installation of sealant over joint surfaces which have been painted, lacquered, waterproofed or treated with water repellent or other treatment or coating unless a laboratory test for durability (adhesion), has successfully demonstrated that sealant bond is not impaired by the coating or treatment. If laboratory test has not been performed, or shows bond interference, remove coating or treatment from joint surfaces before installing sealant.
- C. Clean concrete and masonry joint surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance.
- D. Install sealant backer rod except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.
- E. Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
- F. Install sealants to depths as recommended by the sealant manufacturer. Caulk or seal all joints where indicated or required for a complete and approved installation.
- G. Spillage: Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces including rough textures. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or the sealant/caulking compound.
- H. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

- I. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.4 APPLICATION

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Back-up: Install back-up material to proper depth in joints. Use back-up material of suitable size and shape, so that when compressed (25 to 50%), it will fit in joints as required. When using back-up of hose or rod stock, roll the material into the joint to avoid lengthwise stretching. Do not twist or braid hose or rod stock. Use bond-breaker strip in all joints where sufficient room for back-up material does not exist.
- C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.
- D. Backer Rods and Tape:
 1. For 3/16-inch or wider joints, install backer rod for sealants, except where recommended to be omitted by sealant manufacturer for indicated application.
 2. For joints 3/16-inch or wider, install bond breaker tape where required by manufacturer's recommendations to ensure that liquid applied sealants will perform as intended.
- E. Primer: Prime surface in accordance with manufacturer's recommendations, and allow to dry before applying sealing material.
- F. Sealant: Follow manufacturer's instructions regarding mixing, pot life and application procedure. Do not apply sealing materials when the temperature of the material, air or substrate is below 45 degrees F. or during wet or humid weather. Apply sealing materials in full bead and force into joint.
- G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.
- H. Deposit sealants in uniform, continuous ribbons without gaps or air pockets. Completely wet joint bond surfaces equally on opposite sides. Fill sealant rabbet to slightly concave surface, slightly below adjoining surfaces.
- I. Tooling: Tool joints to compress the compound into the joint. Except as recommended by the sealing material manufacturer, do not use liquid solutions to moisten tools. Remove masking tape immediately after tooling.

- J. Tooling of Non-sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
 - 1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- K. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

3.5 CLEANING

- A. Remove excess and spillage of compound promptly as the work progresses. Clean the adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage, without damage to the adjoining surfaces or finishes. Rake joints to full width and depth. Remove loose particles present or resulting from cleaning operations by blowing out joints with oil free compressed air. All traces of bituminous materials must be removed.
- B. Porous Surfaces: Clean porous surfaces, such as concrete and masonry, by grinding, blast-cleaning, mechanical abrading, acid washing or combination of these methods to provide a clean, sound base surface for caulking and sealant adhesive. Remove form oils by blast-cleaning. Insure that concrete is fully cured and free from laitance, loose aggregate and surface treatments. If surface treatments are present, test for adhesion before proceeding with sealing work.
- C. Non-porous Surfaces: Clean non-porous surfaces, such as metal and glass, in accordance with system manufacturer's recommendations. Do not use solvents that leaves a residue. Apply and remove solvents with clean, white cloths. Do not allow solvents to air dry without wiping.

3.6 CURE AND PROTECTION

- A. Cure sealant compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability.
- B. The Installer shall advise the Contractor of procedures required for the curing and protection of sealants and caulking compounds during the construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at the time of Owner's acceptance.
- C. Replace or restore sealants which are damaged or deteriorated during construction period.

3.7 CAULKING & SEALANTS SCHEDULE.

- A. Sealants:
 - 1. Interior: Caulking, Type S, Silicone, Grade NS, Class 50:
 - a. Wet areas:
 - 1) Mildew resistant, Use "O."
 - 2) Color match grout color & adjacent fixture colors.
 - b. Painted joints: Type S, Grade NS, Class 50, Use "M, G, A & O."
 - c. Caulk all open joints & dissimilar materials.
 - d. Caulk all plumbing fixtures to floor, wall & counters.
- B. Reference:

Type S	Single
Type M	Multi-Component
Grade	NS

Class	50
“M”	Mortar
“G”	Glass
“A”	Aluminum
“O”	Other
Preformed Foam Sealant	

END OF SECTION

DIVISION 8 - OPENINGS
SECTION 08 11 13 – HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes:
 - 1. Hollow metal window frames
 - 2. Materials installation and accessories.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 08 71 00 "Door Hardware" for door hardware and weather-stripping.
 - 2. Section 09 29 00 "Gypsum Board Assemblies" for spot grouting frames in gypsum board partitions.
 - 3. Section 09 91 00 "Painting" for field painting primed doors and frames.

1.2 SUBMITTALS

- A. General: Submit each item in this Article according to Section 01 33 00 "Submittals".
- B. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.
- C. Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
- D. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
 - 1. Indicate coordination of glazing frames and stops with glass and glazing requirements.

1.3 QUALITY ASSURANCE

- A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.
- B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E 152, and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to State Fire Marshal.
 - 1. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to promote air circulation.

1.5 WARRANTY

- A. Manufacturer to repair or replace any defect in product or workmanship for one (1) year. See manufacturer's warranty for specific details.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Steel Doors and Frames:
 - a. Amweld Building Products, Inc.
 - b. Ceco Door Products. (Basis of Design) **(Welded frames)**
 - c. Curries Co.
 - d. Fenestra Corp.
 - e. Kewanee Corp.
 - f. Mesker Door, Inc.
 - g. Pioneer Industries.
 - h. Republic Builders Products.
 - i. Steelcraft.
 - j. D & D Specialties, Inc.
 - k. Rediframe products, Rediflex (Basis of Design) **(Knockdown frames)**

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A 569 (ASTM A 569M).
- B. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality, special killed.
- C. Galvanized Steel Sheets: Zinc-coated carbon steel complying with ASTM A 526 (ASTM A 526M), commercial quality, or ASTM A 642 (ASTM A 642M), drawing quality, hot-dip galvanized according to ASTM A 525, with A 60 or G 60 (ASTM A 525M, with Z 180 or ZF 180) coating designation, mill phosphatized.
- D. Supports and Anchors: Fabricated from not less than 0.0598-inch- (16 gage) thick steel sheet; 0.0598-inch- (16 gage) thick galvanized steel where used with galvanized steel frames. Wire anchors are not acceptable.
- E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.
- F. 16-gauge stainless steel door frames, brushed-US 304.

2.3 FRAMES

- A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, according to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules, minimum 16 gage with concealed fastenings, fully welded with integral stops. Fabricate frames of minimum 16 gage thick cold-rolled steel sheet.
1. 16 gauge non-kerf adjustable throat frame cold rolled steel for interior door frame.
 2. Floor anchors: Provide minimum 16 gauge floor anchors punched for bolting to floor.
- B. Door Silencers: Except on weather-stripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.
- C. Plaster Guards: Provide minimum 0.0179-inch- (0.45-mm-) thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

- D. Grout: Required in masonry construction, as specified in Section 04 20 00 "Unit Masonry." Grout frames in interior gypsum partitions as detailed and in conformance with tested fire rated assembly.

2.4 FABRICATION

- A. Fabricate frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.
 - 1. Internal Construction: One of the following manufacturer's standard core materials according to SDI standards:
 - a. Rigid polyurethane conforming to ASTM C 591, Exterior doors.
 - b. Mineral Core for rated and tested door assemblies.
 - 2. Clearances: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between non-fire-rated pairs of doors. Not more than 3/4 inch at bottom.
 - a. Fire Doors: Provide clearances according to NFPA 80.
- B. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- C. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- D. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.
 - 1. For door closers, provide space, reinforcing, and provisions for fastening in top rail of doors or head of frames, as applicable.
- E. Reinforce frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- F. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes.
- C. Apply primers and organic finishes to doors and frames after fabrication.

2.6 GALVANIZED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces with nonpetroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
- B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
 - 1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

2.7 STEEL SHEET FINISHES

- A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).
- B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.
- C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. Place frames before constructing enclosing walls and ceilings.
 - 2. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.
 - 3. Install fire-rated frames according to NFPA 80.

3.2 ADJUSTING AND CLEANING

- A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION

DIVISION 8 - OPENINGS
SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Solid-core doors with wood-veneer faces.
 2. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, trim for openings.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
1. Indicate dimensions and locations of mortises and holes for hardware.
 2. Indicate dimensions and locations of cutouts.
 3. Indicate requirements for veneer matching.
- C. Samples for Verification: As follows:
1. Corner sections of doors approximately 8 by 10 inches (200 by 250 mm) with door faces and edgings representing the typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for field-finished doors.
 2. Louver blade and frame sections, 6 inches long, for each material and finish specified.
 3. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with the following standard:
1. NWWDA Quality Standard: NWWDA I.S.1-A, "Architectural Wood Flush Doors."
 2. AWI Quality Standard: AWI's "Architectural Woodwork Quality Standards" for grade of door, core, construction, finish, and other requirements.
 3. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
 4. Test Pressure: Test at atmospheric pressure.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's written instructions.
1. Individually package doors in plastic bags or cardboard cartons.
- B. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags or concealed markings.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet-work is complete.

1.6 WARRANTY

- A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of their rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of

the Contract Documents.

- B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form, signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4" in a 42-by-84" section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3" span, or do not comply with tolerances in referenced quality standard.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall be in effect during the following period of time after the date of Substantial Completion:
 - a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Flush Wood Doors:
 - a. Masonite Architectural (Algoma)
 - b. VT Industries
 - c. Osh Kosh Door Company

2.2 DOOR CONSTRUCTION, GENERAL

- A. Doors for Transparent Factory Finish: Comply with the following requirements:
 - 1. Grade: Premium, with Grade AA faces.
 - 2. Faces: Select **white** birch veneer, rotary-sliced
 - 3. Match: Slip & Balance matched
 - 4. Stiles: Same species as face.
- B. Solid core doors.
- C. Particleboard Cores: Comply with the following requirements:
 - 1. Particleboard: ANSI A208.1, Grade LD-2.
 - 2. Blocking: Provide fire-rated wood blocking at particleboard-core doors as follows:
 - a. 5-inch (125-mm) top-rail blocking, at doors indicated to have closers.
 - b. 5" bottom-rail blocking, at exterior doors & doors indicated to have kick, mop, or armor plates.
- D. Interior Veneer-Faced Doors: Comply with the following requirements:
 - 1. Core: Particleboard core.
 - 2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.
- E. Edge Sealing
 - 1. Top and bottom edge of doors to be sealed, regardless of whether doors are factory or field finished.

2.3 LIGHT FRAMES

- A. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet, factory primed and approved for use in doors of fire rating indicated.

2.4 FABRICATION

- A. Fabricate flush wood doors in sizes indicated for Project site fitting.

- B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
 - 1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-rated doors.
- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind of door required.
 - 1. Light Openings: Trim openings with moldings of material indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 08 71 00 "Door Hardware."
- B. Manufacturer's Written Instructions: Install wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
- C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
 - 1. Clearances: Provide 1/8" at heads, jambs, and between pairs of doors. Provide 1/8" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING AND PROTECTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.
- C. Protect doors as recommended by door manufacturer to ensure that wood doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

DIVISION 8 – DOORS AND WINDOWS
SECTION 08 71 00 – DOOR HARDWARE

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Hardware for wood doors.
- B. Hardware for fire-rated doors.
- D. Lock cylinders for doors for which hardware is specified in other sections.

1.2 RELATED REQUIREMENTS

- A. Section 06 40 00 “Interior Architectural Woodwork”.
- B. Section 08 11 13 “Hollow Metal Doors and Frames”.
- C. Section 08 14 16 “Flush Wood Doors”.

1.3 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition; (ADA Standards for Accessible Design).
- B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
- C. BHMA A156.1 - American National Standard for Butts and Hinges; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.1).
- D. BHMA A156.2 - American National Standard for Bored and Preamsembled Locks & Latches; Builders Hardware Manufacturers Association; 2011 (ANSI/BHMA A156.2).
- E. BHMA A156.3 - American National Standard for Exit Devices; Builders Hardware Manufacturers Association; 2008 (ANSI/BHMA A156.3).
- F. BHMA A156.4 - American National Standard for Door Controls - Closers; Builders Hardware Manufacturers Association, Inc.; 2008 (ANSI/BHMA A156.4).
- G. BHMA A156.5 - Cylinders and Input Devices for Locks; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.5).
- H. BHMA A156.6 - American National Standard for Architectural Door Trim; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.6).
- I. BHMA A156.7 - American National Standard for Template Hinge Dimensions; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.7).
- J. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; Builders Hardware Manufacturers Association, Inc.; 2010 (ANSI/BHMA A156.8).
- K. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).
- L. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; Builders Hardware Manufacturers Association; 2012 (ANSI/BHMA A156.13).
- M. BHMA A156.14 - American National Standard for Sliding & Folding Door Hardware; Builders Hardware Manufacturers Association; 2007 (ANSI/BHMA A156.14).

- N. BHMA A156.15 - American National Standard for Release Devices - Closer Holder, Electromagnetic and Electromechanical; Builders Hardware Manufacturers Association; 2011 (ANSI/BHMA A156.15).
- O. BHMA A156.16 - American National Standard for Auxiliary Hardware; Builders Hardware Manufacturers Association; 2008 (ANSI/BHMA A156.16).
- P. BHMA A156.18 - American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association, Inc.; 2012 (ANSI/BHMA A156.18).
- Q. BHMA A156.21 - American National Standard for Thresholds; Builders Hardware Manufacturers Association; 2009 (ANSI/BHMA A156.21).
- R. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2012 (ANSI/BHMA A156.22).
- S. BHMA A156.23 - American National Standard for Electromagnetic Locks; Builders Hardware Manufacturers Association, Inc.; 2010 (ANSI/BHMA A156.23).
- T. BHMA A156.31 - Electric Strikes and Frame Mounted Actuators; 2007 (ANSI/BHMA A156.31).
- U. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.
- V. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.
- W. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 2004.
- X. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; Door and Hardware Institute; 1993; also in WDHS-1/WDHS-5 Series, 1996.
- Y. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2013.
- Z. NFPA 101 - Life Safety Code; National Fire Protection Association; 2012.
- AA. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.
- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- C. Convey Owner's keying requirements to manufacturers.
- D. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by all affected installers.
- E. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.5 SUBMITTALS

- A. See Section 01 33 00 "Submittals", for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.

- C. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.
- D. Keying Schedule: Submit for approval of Owner.
- E. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.
- F. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 40 00 "Quality Requirements", for additional provisions.
 - 2. Tools: One set of all special wrenches or tools applicable to each different or special hardware component, whether supplied by the hardware component manufacturer or not.
 - 3. Extra Door Hardware: Provide (2) sets of classroom hardware for Owner's attic stock.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with a minimum of three years of documented experience.
- B. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with 5 years of experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.8 WARRANTY

- A. See Section 01 77 00 "Closeout Procedures", for additional warranty requirements.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
 - 5. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
 - 6. Special Warranty Periods (Door Hardware):
 - a. **Three years** for mortise locks and latches.
 - b. **Ten years** for cylindrical lever locks.
 - c. **Five years** for exit hardware.
 - d. **Ten years** for manual door closers.
 - e. **Two years** for electromechanical door hardware.

PART 2 – PRODUCTS

2.1 DOOR HARDWARE - GENERAL

- A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.
- B. Provide all items of a single type of the same model by the same manufacturer.

- C. Provide products that comply with the following:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. ADA Standards for Accessible Design.
 - 3. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
 - 4. Applicable provisions of NFPA 101, Life Safety Code.
 - 5. Fire-Rated Doors: NFPA 80.
 - 6. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.
 - 7. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.
- D. Function: Lock and latch function numbers and descriptions of manufactures series as listed in hardware schedule.
- E. Electrically Operated and/or Controlled Hardware: Provide all power supplies, power transfer hinges, relays, and interfaces required for proper operation; provide wiring between hardware and control components and to building power connection.
- F. Finishes: Identified in schedule.
- G. Fasteners:
 - 1. Mineral Core Wood Doors: Six bolts.
 - 2. Concrete and Masonry Substrates: Stainless steel machine screws and lead expansion shields.

2.2 HINGES

- A. Hinges: Provide hinges on every swinging door.
 - 1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
 - 2. Provide ball-bearing hinges at all doors having closers.
 - 3. Provide hinges in the quantities indicated.
 - 4. Provide non-removable pins on exterior outswinging doors.
 - 5. Where electrified hardware is mounted in door leaf, provide power transfer hinges.
- B. Butt Hinges: Comply with BHMA A156.1 and A156.7; standard weight, unless otherwise indicated.
- C. Quantity of Hinges Per Door:
 - 1. Doors up to 60 inches High: Two hinges.
 - 2. Doors From 60 inches High up to 90 inches High: Three hinges.
 - 3. Doors 90 inches High up to 120 inches High: Four hinges.
 - 4. Doors over 120 inches High: One additional hinge per each additional 30 inches in height.
 - 5. Dutch Doors: Two hinges each leaf.
- D. Manufacturers - Hinges:
 - 1. Assa Abloy McKinney: www.assaabloydss.com.
 - 2. Bommer Industries, Inc: www.bommer.com.
 - 3. Hager Companies: www.hagerco.com.
 - 4. Stanley Black & Decker: www.stanleyblackanddecker.com.
 - 5. Ives: www.ives.ingersollrand.com
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.

2.3 LOCKS AND LATCHES

- A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
 - 1. Hardware Sets indicate locking functions required for each door.
 - 2. If no hardware set is indicated for a swinging door provide an office lockset.

3. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
 4. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.
- B. Electrically Operated Locks: Fail secure unless otherwise indicated.
- C. Lock Cylinders: Manufacturer's standard tumbler type, six-pin interchangeable core.
1. SARGENT TO MATCH EXISTING
 2. Provide cams and/or tailpieces as required for locking devices required.
- D. Keying: Great grand master keyed.
1. Include construction cores.
 2. Key to existing keying system.
 3. Supply keys in the following quantities:
 - a. 5 master keys, each group.
 - b. 5 grand master keys.
 - c. 0 great grand master keys.
 - d. 3 change keys for each lock.
 - e. 2 control keys.
- E. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

2.4 MORTISE LOCKSETS

- A. Manufacturers - Mortise Locksets:
1. Sargent: www.assaabloydss.com.
 2. Schlage: www.schlage.com.
 3. Substitutions: Not permitted.

2.5 EXIT DEVICES

- A. Locking Functions: Functions as defined in BHMA A156.3, and as follows:
1. Entry/Exit, Always-Unlocked: Outside lever unlocked, no outside key access, no latch holdback.
 2. Entry/Exit, Free Swing: Key outside retracts latch, latch holdback (dogging) for free swing during occupied hours, not fire-rated; outside trim must be specified as lever or pull.
 3. Entry/Exit, Always-Latched: Key outside locks and unlocks lever, no latch holdback (dogging).
 4. Entry/Exit, Always-Locked: Key outside retracts latchbolt but does not unlock lever, no latch holdback.
- B. Manufacturers:
1. Sargent: www.assaabloydss.com.
 2. Von Duprin: www.vonduprin.com.
 3. Substitutions: Not permitted.

2.6 CLOSERS

- A. Closers: Complying with BHMA A156.4.
1. Provide surface-mounted, door-mounted closers unless otherwise indicated.
 2. Provide a door closer on every exterior door.
 3. Provide a door closer on every fire- and smoke-rated door. Spring hinges are not an acceptable self-closing device unless specifically so indicated.
 4. On pairs of swinging doors, if an overlapping astragal is present, provide coordinator to ensure the leaves close in proper order.
 5. At corridors, locate door-mounted closer on room side of door.
 6. At out swinging exterior doors, mount closer in inside of door.

- B. Manufacturers - Closers:
 - 1. Assa Abloy Norton, Sargent: www.assaabloydss.com.
 - 2. LCN: www.lenclosers.com.
 - 3. Substitutions: Not permitted.

2.7 STOPS AND HOLDERS

- A. Stops: Complying with BHMA A156.8; provide a stop for every swinging door, unless otherwise indicated.
 - 1. Provide wall stops, unless otherwise indicated.
 - 2. If wall stops are not practical, due to configuration of room or furnishings, provide overhead stop.
 - 3. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop unless specifically so stated.
- B. Manufacturers - Overhead Holders/Stops:
 - 1. Assa Abloy Rixson or Sargent: www.assaabloydss.com.
 - 2. DORMA Group North America: www.dorma-usa.com/usa.
 - 3. Glynn-Johnson: www.glynn-johnson.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Manufacturers - Wall and Floor Stops/Holders:
 - 1. Assa Abloy McKinney: www.assaabloydss.com.
 - 2. Hager Companies: www.hagerco.com.
 - 3. Ives: <http://www.ives.ingersollrand.com>
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Manufacturers - Magnetic Holder/Releases:
 - 1. Hager Companies: www.hagerco.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.8 PROTECTION PLATES AND ARCHITECTURAL TRIM

- A. Protection Plates:
 - 1. Kickplate: Provide on push side of every door with closer, except storefront and all-glass doors.
 - 2. Mop Plates: Provide on inside face of doors in wet locations.
- B. Drip Guard: Provide projecting drip guard over all exterior doors unless they are under a projecting roof or canopy.
- C. Manufacturers - Protection Plates and Architectural Trim:
 - 1. Ives Manufacturing: www.ives.ingersollrand.com
 - 2. Hager Companies: www.hagerco.com.
 - 3. Hiawatha, Inc: www.hiawathainc.com.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available to power operated devices and of the correct characteristics.

3.2 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.

- B. Use templates provided by hardware item manufacturer.
- C. Do not install surface mounted items until finishes applied to substrate are complete.
- D. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.
- E. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted:
 - 1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."
 - 2. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."

3.3 ADJUSTING

- A. Adjust hardware for smooth operation.
- B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.4 CLEANING

- A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.5 PROTECTION

- A. Protect finished Work under provisions of Division 1.
- B. Do not permit adjacent work to damage hardware or finish.

3.6 SCHEDULE – ATTACHED (See Drawings for New Door and Frame Schedules)

HW SET: 6.01 Typical Classroom,

Each To Have:

3	Ball Bearing Hinges	FBB179-US26D 4 ½ x 4 ½	ST
1	Classroom Security	11-63-8238 LNB-US26D	SG
1	Convex Wall Stop	406-US32D	RW
1	Set Seals	303AV - 36x84"	PK
1	Sweeps	307AV – 36"	PK

END OF SECTION

DIVISION 8 - OPENINGS
SECTION 08 81 00 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Door vision lites.

1.2 DEFINITIONS

- A. Manufacturer is used in this Section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation.
- B. Glass Design: Glass thicknesses indicated on Drawings are for detailing only. Confirm glass thicknesses by analyzing in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria:
 - 1. Minimum glass thickness, nominally, of lites is 6.0 mm (0.23 inch).
- C. Wire Glass: Wire glass is not allowed. All new fire-rated doors & windows shall have fire-rated glazing to comply with NFPA 101: 8.2.3.2.2.

1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each glass product and glazing material indicated.
- C. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.
 - 1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. FGMA Publications: "FGMA Glazing Manual."
 - 2. SIGMA Publications: TM-3000 "Vertical Glazing Guidelines".
- B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
 - 1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

- C. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E 152, labeled and listed by UL or another testing and inspecting agency acceptable to Architect.
- D. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
 - 1. Insulating Glass Certification Council (IGCC).
 - 2. Associated Laboratories, Inc. (ALI).
 - 3. National Certified Testing Laboratories (NCTL).
- E. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.
- F. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:
 - 1. Primary glass of each (ASTM C 1036) type and class indicated.
 - 2. Heat-treated glass of each (ASTM C 1048) condition indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 WARRANTY

- A. Manufacturer's Warranty on Glass Products: Warranty Period: Manufacturer's standard but not less than 5 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIRE RATED GLAZING PRODUCTS

- A. Laminated Glass with Intumescent Interlayers: Proprietary Category II safety glazing product in the form of multiple lites of Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Kind FT (fully tempered) float glass laminated with intumescent interlayers; and as follows:
 - 1. Fire-Protection Rating: As indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Product: Subject to compliance with requirements, "PyroStop" by Pilkington Building Products North America and distributed by Technical Glass Products.

2.2 HEAT-TREATED FLOAT GLASS

- A. Uncoated, Clear, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below.
- B. Fabrication Process: By vertical (tong-held) or horizontal (roller-hearth) process, at manufacturer's option, except provide horizontal process where indicated as tongless or free of tong marks.
 - 1. Kind FT (fully tempered) where indicated.
- C. Coated, Tinted, Heat-Treated Float Glass: ASTM C 1048, Condition C (other coated glass), Type I (transparent glass, flat), Class 2 (tinted heat-absorbing and light-reducing), Quality q3 (glazing select), with kind, coating type, and performance characteristics complying with requirements specified under coated glass products.
- D. Manufacturers: Subject to compliance with requirements, provide heat-treated glass by one of the following companies.
 - 1. AFG Industries, Inc.

2. Saint-Gobain.
3. PPG Industries, Inc.
4. Spectrum Glass Products, Inc.
5. Tempglass.
6. Viracon, Inc.

2.3 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glazing glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
 3. Colors: Provide color of exposed joint sealants to match adjacent material color.
- B. Elastomeric Glazing Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements indicated on each Elastomeric Glazing Sealant Product Data Sheet at the end of this Section, including those referencing ASTM classifications for Type, Grade, Class and Uses.
 1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Glazing Sealant Product Data Sheet, provide products, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, with the capability to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.
- C. Glazing Sealant for Fire-Resistant Glazing Products: Identical to product used in test assembly to obtain fire-resistive rating.

2.4 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, non-staining and non-migrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800 for products indicated below:
 1. AAMA 806.1.
- B. Products: Subject to compliance with requirements, provide one of the following:
 1. Back-Bedding Mastic Glazing Tape Without Spacer Rod:
 - a. Dyna-Seal, Pecora Corp.
 - b. PTI 626 Architectural Sealant Tape, Protective Treatments, Inc.
 - c. S-M 5710 H.P Poly-Glaze Tape Sealant, Schnee-Morehead, Inc.
 - d. SST-800 Tape, Tremco, Inc.

2.5 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 1. Neoprene, ASTM C 864.
 2. EPDM, ASTM C 864.
 3. Silicone, ASTM C 1115.
 4. Thermoplastic polyolefin rubber, ASTM C 1115.
 5. Any material indicated above.
- B. Soft Compression Gaskets: Extruded or molded closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:

1. Neoprene.
 2. EPDM.
 3. Silicone.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following companies.
1. Preformed Gaskets:
 - a. Advanced Elastomer Systems, L.P.
 - b. Schnee-Morehead, Inc.
 - c. Tremco, Inc.

2.6 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).
- F. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-extruding, non-outgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.
- G. Reflective Film: Lumar window film for interior safety one-way mirror – R15G.

2.7 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.2 GLAZING, GENERAL

- A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions shall provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass from edge damage during handling and installation.
- D. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible

sealant suitable for heel bead.

- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:
 - 2. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.
 - 3. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.

3.3 GLAZING TAPES

- A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sight-line of stops.
- B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.
- C. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- D. Do not remove release paper from tape until just before each lite is installed.
- E. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.4 PROTECTION AND CLEANING

- A. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- B. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.
- C. Wash glass on both faces not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION

DIVISION 9 - FINISHES
SECTION 09 29 00 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Non-load-bearing steel framing members for gypsum board assemblies.
 - 2. Gypsum board assemblies attached to steel framing.
 - 3. Fire rated walls and ceiling systems.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 05 40 00 "Cold Formed Metal Framing" for Load Bearing Steel Framing.
 - 2. Section 07 84 00 "Firestopping" for firestopping systems and fire-resistance-rated joint sealants.

1.2 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.3 ASSEMBLY PERFORMANCE REQUIREMENTS

- A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
- B. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Section 01 33 00 "Submittals".
- B. Product Data for each type of product specified.
- C. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.
- D. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.
 - 1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Welding Certificates: Copies of certificates for welding procedures and personnel.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified

1.5 QUALITY ASSURANCE

- A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.

- B. Single-Source Responsibility for Panel Products and Finishing Materials: Obtain each type of gypsum board and other panel products from a single manufacturer.
- C. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:
 - 1. Fire-Resistance Ratings: As indicated by GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Deflection and Firestop Track: Top runner provided in fire-resistance-rated assemblies indicated is labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier. Temporary factory –applied plastic packaging **must** be removed upon receipt.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.
- B. Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours before application and continuously after until dry. Do not exceed 95 deg F when using temporary heat sources.
- C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Steel Framing and Furring:
 - a. Clark Steel Framing, Inc.
 - b. Consolidated Systems, Inc.
 - c. Dale Industries, Inc.
 - d. Dietrich Industries, Inc.
 - e. Marino/Ware (formerly Marino Industries Corp.).
 - f. National Gypsum Co.; Gold Bond Building Products Division.
 - g. Unimast, Inc.
 - 2. Gypsum Board and Related Products:
 - a. Georgia-Pacific Corp.
 - b. National Gypsum Co.; Gold Bond Building Products Division.
 - c. United States Gypsum Co.
 - d. American Gypsum

- B. Products: Subject to compliance with requirements, provide one of the following products where proprietary gypsum wallboard is indicated:
1. Gold Bond XP Fire Shield; National Gypsum Co.; Gold Bond Building Products Division.
 - a. Purple face paper, gray back paper
 2. SHEETROCK Brand Gypsum Panels, Mold Tough AR FIRECODE Core; United States Gypsum Co.
 - a. Green face paper, brown back paper
 3. DensShield Fireguard Type X; Georgia-Pacific Corp.
 4. M-Bloc® Type X; American Gypsum.
 5. Firestop Type C; Georgia-Pacific Corp.

2.2 STEEL FRAMING FOR NON-LOAD BEARING PARTITIONS

- A. General: Provide steel framing members complying with the following requirements:
1. Protective Coating: ASTM A 653, G 40 (ASTM A 653M, Z 90) hot-dip galvanized coating.
- B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
1. Thickness: 0.0359 inch (20gauge) unless otherwise indicated.
 2. Depth: 3-5/8 inches (92.1 mm), unless otherwise indicated.
 3. Depth: 1-1/2 & 2-1/2 inch furring studs where indicated.
 4. Conform to proprietary fire rated framing systems, i.e.: USG shaftwall and horizontal shaft fire rated enclosure systems. Provide UL tested system components for a complete tested fire rated assembly.
- C. Furring Brackets: Serrated-arm type, adjustable, fabricated from corrosion-resistant steel sheet complying with ASTM C 645, minimum thickness of base (uncoated) metal of 0.0329 inch (0.84 mm), designed for screw attachment to steel studs and steel rigid furring channels used for furring.
- D. Steel Channel Bridging: Cold-rolled steel, 0.0598-inch minimum thickness of base (uncoated) metal and 7/16-inch- wide flanges, 1-1/2 inches deep, 475 lb/1000 feet, unless otherwise indicated.
- E. Steel Flat Strap and Backing Plate: Steel sheet for blocking and bracing complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M), length and width as indicated, and with a minimum base metal (uncoated) thickness as follows:
1. Thickness: 0.0598 inch (1.5 mm) where indicated.
- F. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.3 GYPSUM BOARD PRODUCTS

- A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
1. Widths: Provide gypsum board in widths of 48 inches (1219 mm).
- B. Gypsum Wallboard: ASTM C 36 and as follows:
1. **ALL gypsum wallboard to be type “X”, “M/R” & mold resistant unless noted otherwise.**
 2. Proprietary type as required for specific fire-resistance-rated assemblies.
 3. Edges: Tapered.
 4. Thickness: 5/8 inch, minimum (15.9 mm).
- C. Conform with Tested Assemblies for Fire Rated System compliance.

2.4 TRIM ACCESSORIES

- A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:
 - 1. Material: Formed metal or plastic, with metal complying with the following requirement:
 - a. Steel sheet zinc coated by hot-dip process or rolled zinc.
 - 2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
 - a. Cornerbead on outside corners, unless otherwise indicated.
 - b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
 - c. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
 - 3. Use stainless steel screws for drywall attachment to aluminum framing systems.

2.5 JOINT TREATMENT MATERIALS

- A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.
- B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.
 - 1. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.
- C. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
 - 1. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
 - 2. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer.
 - 3. For topping compound, use sandable formulation.
- D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
 - 1. Ready-Mixed Formulation: Factory-mixed product.
 - a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
 - b. Topping compound formulated for fill (second) and finish (third) coats.
 - c. All-purpose compound formulated for both taping and topping compounds.
- E. Acoustic Sealant for Gypsum Board: Factory-packaged acrylic, latex-based products complying with the following requirements for formulation and intended use.
 - 1. Can be used as fire-caulk in UL classified joint systems
 - 2. Meets ASTM C834 specifications for latex sealants
 - 3. Surface burning characteristics of 0/0
 - 4. Low VOC (<15 g/l)
 - 5. Sheetrock Brand Acoustic Sealant used as Basis of Design

2.6 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.

- C. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
- D. Sound-Attenuation Blankets: Unfaced mineral-fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing).
 - 1. Mineral-Fiber Type: Fibers manufactured from glass, slag wool, or rock wool.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Ceiling Anchorages: Coordinate installation of above ceiling wall bracing at all interior partitions.

3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."
- C. Isolate steel framing from building structure at non-load bearing walls to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.
 - 1. Where building structure abuts ceiling perimeter or penetrates ceiling.
 - 2. Where partition framing and wall furring abut structure, except at floor.
 - a. Install deflection and firestop track top runner at fire-resistance-rated assemblies where indicated.
 - b. Attach jamb studs at openings to tracks using manufacturer's standard stud clip.

3.4 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

- A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
 - 1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.
- B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural framing or deck. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - 1. Cut studs 1/2 inch (13 mm) short of full height to provide perimeter relief.
 - 2. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.

- D. Install steel studs and furring in sizes and at spacings indicated.
 - 1. Single-Layer Construction: Space studs 16 inches o.c., unless otherwise indicated.
- E. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.
- F. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - 1. Install 2 studs at each jamb, unless otherwise indicated.
 - 2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (12.7-mm) clearance from jamb stud to allow for installation of control joint.
 - 3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

3.5 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

- A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
- B. Install sound-attenuation blankets, in all walls, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- C. Install gypsum panels with face side out. Install wall panels vertically to minimize and eliminate end butt joints. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16" of open space between panels. Do not force into place.
- D. Locate both edge or end joints over supports. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.
- E. Attach gypsum panels to studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- F. Attach gypsum panels to framing provided at openings and cutouts.
- G. Grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches wide. Apply grout at each jamb and head and immediately insert gypsum panels into frames.
- H. Cover both faces of stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.
 - 1. Fit gypsum panels around ducts, pipes, and conduits.
 - 2. Where partitions intersect structural members projecting below underside of floor/roof and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- I. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
- J. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
 - 1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.

3.6 GYPSUM BOARD APPLICATION METHODS

- A. Single-Layer Application: Install gypsum wallboard panels as follows:

1. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
- B. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows: Fasten with screws.
- C. Double Layer: Apply 2nd layer gypsum panels with manufacturer's recommended fasteners with staggered joints.

3.7 INSTALLING TRIM ACCESSORIES

- A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.
- B. Install cornerbead at external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
 1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
 2. Install U-bead where indicated.
- D. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by Architect for visual effect.

3.8 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
- B. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.
- C. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
 1. Level 1 - for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies. (embed tape in joint compound)
 2. Level 5 - for gypsum board surfaces, unless otherwise indicated. (embed tape in joint compound, three coats of joint compound at accessories & fasteners, prime & skim coat entire surface)
 - a. Note: Contractors will be allowed to use RUCO RuCoat Equalizer Plus Primer (or approved equal) over a Level 4 finish to achieve a Level 5 appearance.
- D. Use the following joint compound combination as applicable to the finish levels specified:
 1. Embedding and First Coat: Ready-mixed, drying-type, all-purpose or taping compound. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose or topping compound. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.

3.9 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

DIVISION 9 - FINISHES
SECTION 09 51 23 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Ceilings consisting of acoustical tiles and exposed grid suspension systems.
 - 2. Acoustical ceiling panels.
 - 3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

- B. Related Sections:
 - 1. Section 09 29 00 "Gypsum Board Assemblies".
 - 2. Mechanical – See Table of Contents for section number
 - 3. Electrical – See Table of Contents for section number

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Allow with improved Formability.
 - 2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
 - 4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - 5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
 - 6. ASTM C 636 Recommended Practice for Installation for Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
 - 7. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 8. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
 - 9. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
 - 10. ASTM E 1264 Classification for Acoustical Ceiling Products.
 - 11. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
 - 12. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
 - 13. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Materials.

1.3 SUBMITTALS

- A. Product Data: For each type of product specified.
 - 1. Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

- B. Samples for Verification: Full-size units of each type of ceiling assembly indicated; in sets for each color, texture, & pattern specified, showing full range of variations expected in these characteristics.
 - 1. Full-size samples of each acoustical tile type, pattern, and color.
 - 2. Set of 12-inch- long samples of exposed moldings for each color and system type required.
 - 3. Minimum 6 inch x 6 inch samples of specified acoustical panel.
 - 4. 8 inch long samples of exposed wall molding and suspension system, including main runner and cross tees.

- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and

addresses, names and addresses of architects and owners, and other information specified.

- D. Product Test Reports: Indicate compliance of acoustical tile ceilings and components with requirements based on comprehensive testing of current products.
- E. Research/Evaluation Reports: Evidence of acoustical tile ceiling's and components' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
- F. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with or supported by the ceilings.
- G. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC and AC.
- H. If the material supplied by the acoustical subcontractor shall have an Underwriter's Laboratory classification of acoustical performance on every carton.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed acoustical tile ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations for Ceiling Units and Suspension System: Obtain each acoustical ceiling tile and support system from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Fire-Test-Response Characteristics: Provide acoustical tile ceilings that comply with the following requirements:
 - 1. Fire-response tests were performed by UL, ITS/Warnock Hersey, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
 - 2. Surface-burning characteristics of acoustical tiles comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
 - a. Flame Spread: 25 or less.
 - b. Smoke Developed: 50 or less.
 - 3. Fire-resistance-rated assemblies, which are indicated by design designations from UL's "Fire Resistance Directory," from ITS/Warnock Hersey's "Directory of Listed Products," or from listings of another testing and inspecting agency, are identical in materials and construction to those tested per ASTM E 119.
 - 4. Products are identified with appropriate markings of applicable testing & inspecting agency.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical tiles and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient

temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical tiles and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 WARRANTY

- A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
 - 1. Acoustical Panels: Sagging and warping.
 - 2. Grid System: Rusting and manufacturer's defects.
- B. Warranty Period:
 - 1. Acoustical panels: Ten (10) years from date of substantial completion.
 - 2. Grid: Ten (10) years from date of substantial completion.
- C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.9 MAINTENANCE

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
 - 1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Acoustical Tile Ceiling Schedule at the end of Part 3.

2.2 ACOUSTICAL TILES, GENERAL

- A. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring Noise Reduction Coefficient: Type E-400; plenum mounting in which face of test specimen is 15-3/4" away from test surface per ASTM E 795.
- B. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type. Architect reserves the right to select up to three (3) colors.
- C. Tile Characteristics: Comply with requirements indicated in the Acoustical Tile Ceiling Schedule at the end of Part 3, including those referencing ASTM E 1264 classifications.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, & finishes indicated that comply w/applicable ASTM C 635 requirements.

- B. Metal Suspension System Characteristics: Comply with requirements indicated in the Acoustical Panel Ceiling Schedule at the end of Part 3.
- C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
- E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Stainless Steel Wire: ASTM A 641/A 641M, soft temper.
 - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire but provide not less than 0.106-inch- (2.69-mm-) diameter wire.
- F. Hanger Rods: Stainless steel.
- G. Flat Hangers: Stainless steel.
- H. Angle Hangers: Angles with legs not less than 7/8" wide; formed with .125" thick, aluminum.
- I. Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical tile edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
 - 1. Manufacturer: Subject to compliance with requirements, provide products by the following:
 - a. Armstrong World Industries, Inc.
 - b. USG Corporation.
 - c. Certainteed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates & structural framing to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical tile ceilings.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.2 PREPARATION

- A. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other Sections.
 - 1. Furnish concrete inserts and similar devices to other trades for installation well in advance of time needed for coordination of other work.
- B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width units at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical tile ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.

2. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
 3. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings-Seismic Zones 0-2."
- B. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Attach hangers to structural members.
 7. Space hangers not more than 48" o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8" from ends of each member.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.
1. Screw attach moldings to substrate at intervals not more than 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system to a tolerance of 1/8" in 12'. Miter corners accurately and connect securely.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Arrange acoustical tiles as indicated on reflected ceiling plans.
- G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim.
1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
 2. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.
- H. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.
- I. Suspend main beam from overhead construction with hanger wires spaced 4'-0" on center along the length of the main runner. Install hanger wires plumb and straight.
- J. Install wall moldings and intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

- K. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.
- L. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surface. Support edges by wall moldings.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical tile ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
- B. Replace damaged and broken panels.

3.5 ACOUSTICAL TILE CEILING SCHEDULE

A. LAY-IN TILE CEILING

- 1. Wet formed, Mineral-Base Acoustical Tiles for Acoustical Tile Ceiling ATC-[A]: Where this designation is indicated, provide acoustical tiles complying with the following:
 - a. Products:
 - 1) Armstrong Cortega #770 2'x2' tile panels. (Non-Rated Ceilings)
 - 2) USG Radar #2110
 - 3) Certainteed Baroque #BET-157
 - b. Classification: Tiles fitting ASTM E 1264 for Type III, mineral base with painted finish; Form 2, cast or molded.
 - c. Pattern: Tiles fitting ASTM C E 1264 pattern designation D (non-directional fissured.)
 - d. Color: White.
 - e. Light Reflectance Coefficient: Not less than LR 0.82.
 - f. Noise Reduction Coefficient: NRC 0.55.
 - g. Ceiling Attenuation Class: Not less than CAC 33.
 - h. Edge Detail: Square joints.
 - i. Thickness: 5/8 inch.

B. LAY-IN TILE CEILING SUSPENSION

- 1. Suspension System for Acoustical Tile Ceiling ATC-[A]: Where this designation is indicated, provide acoustical tile ceiling suspension system complying with the following:
 - a. Products: Provide one of the following:
 - 1) Armstrong "Prelude" 15/16" suspension system
 - 2) USG DX series
 - 3) Certainteed "Trim" series
 - b. Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with cold-rolled steel sheet, pre-painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G01 (Z001) coating designation; other characteristics as follows:
 - 1) Intermediate-duty system
 - c. Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with aluminum sheet, pre-painted, other characteristics as follows:
 - 1) Intermediate-duty system
 - 2) Aluminum grid, non-corrosive.
 - 3) Color: White

END OF SECTION

DIVISION 9 – FINISHES
SECTION 09 65 30 - RESILIENT BASE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Resilient base. (RB)
- B. Installation accessories.

1.2 REFERENCES

- A. ASTM F 1861 - Standard Specification for Resilient Wall Base; 2002.

1.3 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- B. Shop Drawings: Indicate seaming plan.
- C. Verification Samples: Submit two samples, illustrating color and pattern for each resilient flooring product specified.
- D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- E. Substitutions: Reference Section F for prior approval substitution form.

1.4 DELIVERY, STORAGE, AND PROTECTION

- A. Protect roll materials from damage by storing on end.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

1.6 EXTRA MATERIALS

- A. Provide 120 lineal feet of base of each type and color specified.

PART 2 - PRODUCTS

2.1 MATERIALS – RUBBER BASE

- A. Resilient Base: ASTM F 1861, Type TS rubber, vulcanized thermoset; top set Style A, Coved, and as follows:
 - 1. Height: 4 inches.
 - 2. Thickness: 0.125 inch thick.
 - 3. Finish: Satin.
 - 4. Length: 120 foot Continuous Roll.
 - 5. Color: Black.
 - 6. Accessories: Pre-molded external corners and end stops.
 - 7. Manufacturers:
 - a. Tarkett (Johnsonite)

- b. In Pro Corporation
- c. Burkemercer Flooring Products, Inc:
- d. Roppe Corp

2.2 ACCESSORIES

- A. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
- B. Moldings and Edge Strips: Same material as flooring.
- C. Filler for Coved Base: Plastic.
- D. Sealer and Wax: Types recommended by flooring manufacturer. Conform to Campus Maintenance System materials and installation instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that wall surfaces are smooth and flat within tolerances specified in Section 09255, are dust-free, and are ready to receive resilient base.
- B. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of adhesive materials to sub-floor surfaces.

3.2 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- B. Prohibit traffic until filler is cured.
- C. Clean substrate.
- D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.3 INSTALLATION – BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Install base on solid backing. Fully adhere bond tightly to wall and floor surfaces.

3.4 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean, seal, and wax resilient flooring products in accordance with manufacturer's instructions.

END OF SECTION

DIVISION 9 - FINISHES
SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and field painting of the following:
 - 1. Exposed interior items and surfaces.
 - 2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

- B. Related Sections include the following:
 - 1. Section 05 50 00 "Metal Fabrications" for shop priming ferrous metal.
 - 2. Section 08 11 13 "Hollow Metal Doors and Frames" for shop priming metal doors and frames.
 - 3. Section 09 29 00 "Gypsum Board Assemblies" for surface preparation for gypsum board.
 - 4. Divisions 21, 22, 23, and 26: Painting of mechanical and electrical work is specified in individual divisions.

1.2 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
 - 3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
 - 4. Semi-gloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
 - 5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.3 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.
 - 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis/instructions for handling, storing & applying each coating material proposed for use.
 - 3. Certifications by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

- B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

- C. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
 - 1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 - 2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
 - 3. Submit Samples on the following substrates for Architect's review of color and texture only:
 - a. Gypsum Wallboard: Provide two 12-inch- square samples for each color and finish.

- b. Ferrous Metal: Provide two 4-inch- (100-mm-) square samples of flat metal and two 8-inch- (200-mm-) long samples of solid metal for each color and finish.
- D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.
 - 1. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted.
 - a. Wall Surfaces: Provide samples on at least 100 sq. ft. (9 sq. m) of wall surface.
 - b. Small Areas and Items: The Architect will designate an item or area as required.
 - 2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, the Architect will use the room or surface to evaluate coating systems of a similar nature.
 - b. Final approval of colors will be from job-applied samples.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
 - 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.6 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
 - 1. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. (3.785 L) or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance w/ requirements, provide one of the products in the paint schedules.
- B. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:
 - 1. Sherwin-Williams Co. (SW). (Basis for Design)
 - 2. Benjamin Moore & Co. (Moore).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: Provide custom colors of the finished paint systems to match Architect's selected samples.
- D. Architect may select up to six (6) paint colors.
- E. Contractor shall include the cost to provide one (1) accent wall per room.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.
 - 1. Prior to attempting to remove mildew, it is recommended to test any cleaner on a small, inconspicuous area prior to use. Bleach and bleaching type cleaners may damage or discolor existing paint films. Bleach alternative cleaning solutions are advised.
 - 2. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply solution and scrub the mildewed area. Allow solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow surface to dry before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in

- 3. contact with your skin. Do not add detergents or ammonia to the bleach/water solution. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
 - 4. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.
- B. Drywall - Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.
- C. Galvanized Metal: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP16 is necessary to remove these treatments.

3.3 INSTALLATION

- A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.
- B. Do not apply to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.
- C. Apply coatings using methods recommended by manufacturer.
- D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.
- E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.
- F. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.
- G. Inspection: The coated surface must be inspected and approved by the Architect just prior to the application of each coat.

3.4 PROTECTION

- A. Protect finished coatings from damage until completion of project.
- B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.
- C. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 - 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- D. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but

provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.5 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convactor covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.
 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 8. Finish doors on tops, bottoms, and side edges the same as exterior faces.
 9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
 10. Sand lightly between each succeeding enamel coat.
- B. Scheduling Painting: Apply first coat after surfaces have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 3. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of entire system as recommended by the manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.
- F. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated

by others. Recoat primed and sealed surfaces.

- G. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- H. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
 - 1. Provide satin finish for final coats.
- I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.6 EXECUTION

- A. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
- B. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork and casework.
 - b. Finished mechanical and electrical equipment.
 - c. Light fixtures.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Furred areas.
 - b. Ceiling plenums.
 - c. Pipe spaces.
 - 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper.
 - e. Bronze and brass.
 - 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valves, damper operators and linkages.
 - b. Sensing devices.
 - 5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
 - 6. Fire and/or Smoke Barrier Identification: Per Rule 120-3-3-.04 State Minimum Fire Safety Standards with Modifications for Georgia – 09/25/2023:
 - a. “All fire and/or smoke barriers or walls shall be effectively and permanently identified with signs or stenciling above a decorative ceiling and/or in concealed spaces with letters a minimum of 2 inches (51 mm) high on a contrasting background spaced a maximum of 12 feet (3.7 m) on center with a minimum of one per wall or barrier. The hourly rating shall be included on all rated barriers or walls. Wording shall be similar to the following: '(4)' Hour Fire and Smoke Barrier-Protect All Openings. Where signs are utilized, they shall be designed and installed to resist peeling or detaching from the barrier. Other methods acceptable to the authority having jurisdiction shall be deemed approved.”
 - b. Note: Self-adhered lettering is not acceptable, conform to Section 09 91 00.

3.7 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke testing of applied materials at any time and as often as the Owner deems necessary during the period when paint is being applied.

3.8 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.9 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.10 INTERIOR PAINT SCHEDULE (Colors to be selected by Architect.)

- A. Interior Ferrous Metal (Shop Primed):
 - 1. One Coat – Primer SW Kem Kromik Universal Metal Primer
 - 2. Two Coats – Finish SW Pro Industrial Waterbased Alkyd Urethane Semi-Gloss
- B. Interior Gypsum Wall Board (Eggshell):
 - 1. One Coat – Primer SW ProMar 200 Zero VOC Interior Latex Primer
 - 2. Two Coats – Finish SW ProMar 200 Zero VOC Interior Latex Eg-Shel

END OF SECTION

DIVISION 10 - SPECIALTIES
SECTION 10 10 00 - MARKER BOARDS & TACK BOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Porcelain enamel marker boards, LCS.
- B. Tackboards, vinyl fabric faced.
- C. Visual display board accessories.
- D. Visual display “Clip Strips”.

1.2 REFERENCES

- A. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 33 00 “Submittals”.
- B. Product Data: Provide technical data for products specified. Include Material Safety Data Sheets, when applicable.
- C. Shop Drawings: Provide shop drawings for each type of visual display board specified.
- D. Selection Samples: Submit set of color chips displaying manufacturer’s full range of colors and finishes.
- E. Verification Samples: Submit samples not less than six inches square and framed on two adjacent sides, to illustrate materials, finish, color, and texture of each type of visual display board required.
- F. Maintenance Data: Provide data on cleaning requirements, stain removal, and recommended maintenance precautions.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer’s instructions for handling and storage of units.

1.5 PROJECT CONDITIONS

- A. Field measure prior to preparation of shop drawings and fabrication, to ensure proper fit.
- B. Do not begin installation of visual display boards until environmental conditions approximate normal occupied conditions.

1.6 WARRANTY

- A. Submit manufacturer’s “Life of the Building” warranty, stating that under normal usage and maintenance, and when installed in accordance with manufacturer’s instructions and recommendations, porcelain enamel steel chalkboards and marker boards are guaranteed for the life of the building.
- B. Warranty shall cover replacement of defective boards but not the cost of removal or reinstallation.

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Provide visual display boards conforming with this specification and the Contract Documents, manufactured by one of the following:
1. Claridge Products and Equipment, Inc. (Basis of Design)
 2. Greensteel.
 3. ADP Lemco Inc.
 4. Best-Rite Manufacturing
 5. Nelson-Adams, Lawer Corp.

2.2 MARKER BOARD MATERIALS

- A. Steel Face Sheets: 24 gage commercial quality steel, fired with porcelain enamel, using the DuPont process: 24LCS
1. Face sheets with high-fired brittle ground and finish coats are not acceptable.
 2. Fire porcelain enamel finish at approximately 1000 degrees F, or lowest possible temperature thereunder to reduce steel and porcelain stresses and achieve superior enamel bond and hardness.
- B. Core Material: 7/16 inch MDF.
- C. Backing Material: Foil Back.
- D. Metal Trim and Accessories: ASTM B221 aluminum alloy.
1. Provide all mounting closure trim, clips and angles.
 2. Provide concealed blocking required for mounting to walls.
- E. Laminations: Hot-type neoprene contact adhesive applied to both surfaces automatically.
1. Each substrate shall have minimum 80 percent covering with 1.5-2.0 dry mils of adhesive.
 2. Panel components shall have uniform pressure applied mechanically over entire area.
 3. Laminations shall be made by manufacturer of face sheet.
- F. Adhesive: As recommended by manufacturer for project conditions.

2.3 PORCELAIN ENAMEL MARKER BOARDS

- A. Provide "LCS" marker boards for project from manufacturer's Series 1, with modified map rail.
1. Metal trim and accessories: Slip-on Series heavy gage aluminum extrusions; etched and anodized satin finish.
 - a. Chalktrough: Standard continuous solid type, with ribbed section and injection molded end closures. No. 371A
 - b. Trim: Standard continuous No. 180 and 181.
 - c. Map rail: Standard continuous rail with cork insert and end stops, and as follows:
 - 1) Height: 2 inches.
 - 2) Map hooks: 1 hook for each 3 feet of rail. NO. 76M
 - 3) Roller brackets: 2 brackets per rail. No 76RB
 - 4) Flag holder: 2 holders per rail. No. 76FH
 2. Size: Standard 4 feet height by lengths as shown on drawings.
 3. Color: White.
 4. Provide one set of markers, eraser and cleaning solution.

2.4 TACK BOARDS

- A. Provide tack boards that are integrated with marker boards and independent factory built units, as indicated on the drawings.
1. Metal trim and accessories: Series 1 heavy gage aluminum extrusions; etched and anodized satin finish, without chalktrough.

2. Tack board surfacing: Fabricork Series, Vinyl fabric on 7/32 inch cork underlay with 1/4 inch hardboard back.
3. Size: 4' high x length as indicated on drawings.

2.5 FABRICATION

- A. Laminate facing sheet and backing sheet to core material under pressure, using manufacturer's recommended adhesive.
- B. Provide factory-assembled visual display boards, except where sizes demand partial field assembly.
- C. Assemble units in one piece without joints, wherever possible. Where required dimensions exceed maximum panel size available, provide 2 or more pieces of equal length, as indicated on approved shop drawings. Assemble to verify fit at factory, then disassemble for delivery and final assembly at project site.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that substrates are properly prepared to receive visual display boards. Do not begin installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's installation instructions.
- B. Where visual display boards must be partly assembled at project site, use factory-supplied H-bar to maintain proper alignment.
- C. Install visual display boards level and plumb, keeping perimeter trim aligned in accordance with manufacturer's recommendations.

3.3 ADJUSTING AND CLEANING

- A. Verify that all accessories are installed as required for each unit.
- B. Upon completion of installation, clean surfaces and trim in accordance with manufacturer's recommendations, leaving all materials ready for use.

END OF SECTION

DIVISION 10 - SPECIALTIES
SECTION 10 42 05 - SIGNS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following types of signs:
 - 1. Interior signs.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 23 Section "Mechanical Identification" for labels, tags, and nameplates for mechanical equipment.
 - 2. Division 26 Section "Electrical Identification" for labels, tags, and nameplates for electrical equipment.

1.2 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- C. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, layout, reinforcement, accessories, and installation details.
 - 1. Provide message list for each sign required, including large-scale details of wording and lettering layout.
 - 2. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
 - 3. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.
- D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.
 - 1. Samples for verification of color, pattern, and texture selected and compliance with requirements.

1.3 QUALITY ASSURANCE

- A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.
- B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.
- C. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signs and are based on the specific types indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Interior Sign Manufacturers:
 - a. Advance Process Supply Company.
 - b. Andco Industries Corp.
 - c. ASI Sign Systems, Inc.
 - d. Intelligent Signage, Inc.

- e. Signmark Graphics.
- f. Rohm and Haas.

2.2 MATERIALS

- A. Materials for interior signs shall be Rohm and Haas P-95 Matte Finish Plexiglas, thickness as follows:
 - 1. Sign plates shall be 1/8" thick Plexiglas.
 - 2. Window type signs shall have 1/16" thick clear matte Plexiglas laminated to 1/8" thick White Plexiglas with 1"x1/16" deep milled slots, unless otherwise noted on attached sign drawings.
 - 3. All other Plexiglas for signs shall be 1/8" thick, unless otherwise noted on attached sign drawings.
- B. Color for interior signs:
 - 1. Copy shall be white, Advance Process Supply Company ABS-120, Super White.
 - 2. Emergency oriented signs shall have red background plaques. Red shall be Advance Process Supply Company ABS-520, Satellite Red.
 - 3. All other background plaques shall be Advance Process Supply Company -standard colors selected by Architect.
- C. Graphic Data for interior signs:
 - 1. All copy shall be Century Gothic upper case. Letter size shall be the height indicated on the drawings of individual sign types unless face dimensions and message dictate otherwise. Copy shall be Century Gothic and comply with ADAG handicap requirements.
 - 2. Room numbers and permanent sign letters shall be raised 1/32" as required by A.D.A. Refer to drawings of individual sign type for requirements.
 - 3. Typography shall follow guidelines established in the attached drawings and sign manufacturer's approved ADA signage.
- D. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.
- E. Aluminum Extrusions: Provide aluminum extrusions of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.
- F. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.
- G. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.3 ASSEMBLY

- A. Interior Signs:
 - 1. Sign components shall be mounted to back plates with 1" wide double-sided adhesive vinyl tape.
 - 2. Window type signs shall provide for copy change and shall be composed of a sheet of 1/16" clear matte acrylic that is sub-surface printed, except for the window area, with both (permanent) message and background color, prior to being laminated to a slotted base of 1/8" thick opaque acrylic (except as otherwise noted on attached sign drawings). The slotted base shall have 1" milled slots as required for individual signs. The slots shall receive a copy insert strip of matching color. Windows shall be 7/8". (Slots formed of several pieces or laminated Plexiglas are not acceptable)
 - 3. Copy insert strips for signs shall be 1/16" matte acrylic, surface printed. Insert strips shall have square edges for proper fit in slots.

2.4 SIGN COMPONENTS

- A. Interior Signs: Schedule of Room Number and Identification Signs required: (See attached Sign Schedule at end of Part 3. Sign sizes shall match wording length requirements (see drawing layout 1).

NOTE: Owner to verify sign types & wording.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Locate sign units and accessories as scheduled, using mounting methods of the type described and in compliance with the manufacturer's instructions.
1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Plates for interior signs shall be mounted to walls with double-sided adhesive foam tape. Signs shall be mounted level with top at 5'-0" above finish floor and 2" from door frame on strike side of frame.

3.2 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

3.3 INTERIOR SIGN SCHEDULE

- A. Room number ADA H/C Braille.

3.4 EXTERIOR SIGN SCHEDULE (NOT USED)

END OF SECTION

DIVISION 10 - SPECIALTIES
SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Semi-recessed Fire extinguishers with cabinets. (FEC)
 - 2. Surface mounted fire extinguishers with mounting brackets. (FE)

1.2 SUBMITTALS

- A. General: Submit the following according to Section 01 33 00 "Submittals".
- B. Product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

1.3 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.
- B. Coordination: Verify that cabinets are sized to accommodate type and capacity of extinguishers indicated and provided by Owner under separate Contract.
- C. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.
- D. FM-Listed Products: Fire extinguishers approved by Factory Mutual Research Corporation for type, rating, and classification of extinguisher with FM marking.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Elkart Brass Mfg. Co., Inc.
 - 2. General Fire Extinguisher Corp.
 - 3. Larsen's Mfg. Co.
 - 4. W. C. Allen Mfg. Co.
 - 5. Lyon Metal Products.
 - 6. J.L. Industries.
 - 7. Larsen's Mfg. Co.

2.2 FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, which comply with authorities having jurisdiction.
- B. Multipurpose Dry Chemical Type: UL-rated 4A:80B:C, MP10lb nominal capacity, in enameled steel container.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and

- mounting prior to cabinet installation.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Follow manufacturer's printed instructions for installation.
- B. Install in locations and at mounting heights to comply with applicable regulations of governing authorities.
 - 1. Provide height for Handicap access to fire extinguishers in accordance with ADA GA as adapted by the State of Georgia.
 - 3. Fasten extinguishers to structure, square and plumb.
 - 4. When extinguisher is mounted by bracket on a freestanding column:
 - a. Contractor to paint column "red" starting at 7'-0" AFF, and ending aligned with bottom of extinguisher
 - b. Contractor to paint all visible faces of column.

END OF SECTION

DIVISION 21 – FIRE PROTECTION
SECTION 21 00 00 - GENERAL FIRE SUPPRESSION PROVISIONS

PART 1 - GENERAL

1.1 Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes general provisions covering the contract documents for Fire Protection Systems.

1.3 DEFINITIONS

- A. Provide shall mean "Furnish, install and connect."
B. Piping shall mean "pipe installed with all specified fittings, valves and accessories, and forming a complete system."

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract.
B. Electrical Coordination: In addition to submittal requirements of other Division 21 Sections, submit a document approved by the project Electrical Contractor certifying that all mechanical equipment being furnished under Division 21 complies with the electrical characteristics of the source power which will be furnished under Division 26.
C. Model numbers listed on the Mechanical Contract Documents shall not be construed to indicate electrical characteristics. Electrical characteristics of mechanical equipment shall be as indicated on the Electrical Contract Documents (Division 26).
D. Review of Submittals does not relieve the Contractor of any of the requirements of the Contract Documents. Failure by the Engineer to document errors and omissions in the Contractor's submittals during the Engineer's submittal review does not constitute a waiver of any of the requirements of the original Contract Documents.

1.5 CONTRACTOR QUALIFICATIONS

- A. Fire Protection System Installer qualifications shall be specified in other sections of Division 21.

1.6 PRIOR APPROVALS

- A. Manufacturers References: When reference is made in the Contract Documents to trade names or specific manufacturers and/or models, such reference, unless noted otherwise, is made to designate and identify the quality of materials or equipment to be furnished and is not intended to restrict competitive bidding. If it is desired to use materials or equipment different from those indicated on the Contract Documents, written request for approval must reach the hands of the Design Professional at least TEN DAYS prior to the date set for the opening of bids. A copy of the request should also be sent directly to the Engineer. Requests for prior approval of a proposed substitute shall be accompanied by complete technical data supporting the request.
B. Request for Prior Approval by facsimile transmission (fax) or email will not be considered. Prior approval requests shall be submitted in hard copy format only.

1.7 LAYOUT AND COORDINATION

- A. Layout Basis:
1. The equipment listed on the Drawings and in the Specifications has been used for the physical arrangement of the mechanical systems. When equipment listed as acceptable, equal or equipment which has received "prior approval" is used, it shall be the Contractor's responsibility to provide structural, electrical, service clearances, or other changes required to accommodate the substituted equipment. Changes shall be made at no additional cost to the Owner. Submit a list of required changes along with all prior approval requests and shop drawing submittals.
 2. The Contract Drawings are intended to show the general arrangement of all mechanical work. They do not show in detail all offsets, fittings and transitions. Examine Drawings, investigate site conditions to be encountered and arrange work accordingly. Furnish all offsets and transitions required.
 3. Drawings do not indicate in detail exact configuration of connections for fixtures, equipment and accessories. Final connection shall be as shown on approved Manufacturer's Submittal Drawings. Where Manufacturer's Submittal Drawings conflict with the Contract Documents, confer with the Design Professional for resolution.
 4. Measurement of Drawings by scale shall not be used as dimensions for fabrication. Measurements for locating fixtures, equipment, ductwork, piping and other mechanical items shall be made on the site and shall be based on actual job conditions.
 5. Check space limitations and verify electrical requirements before ordering any mechanical equipment or materials. Place large equipment inside the building prior to the erection of exterior walls where equipment cannot enter finished building openings.
- B. Coordination: Mechanical work shall be coordinated with that of other trades to avoid conflict. The Contractor shall study all plans and specifications for this project and shall notify the Design Professional of any conflict between work under Division 21 and work under other divisions of the Project. Particular attention shall be given to interference between piping, electrical installations, structural systems, building openings and ductwork.
- C. Installation Instructions: Two binders containing manufacturer's installation instructions for all equipment furnished under Division 21 shall be furnished by the Contractor. One binder shall be kept in the General Contractor's office at the job site. The other binder shall be delivered to the Engineer upon acceptance by the Design Professional of the Submittals.
- D. Operation and Maintenance Instructions: Three copies of equipment O&M manuals contained in rigid 3-ring binders shall be submitted to the Owner a minimum of 15 days prior to equipment/systems training. Binders shall have permanent labels on the spine and front cover indicating project name, project number, building name and contents. Model and serial numbers of equipment shall be shown on the cover of their respective O&M manual(s).

1.8 PERMITS

- A. Obtain all necessary Permits and Inspections required for the installation of this work and pay all charges incident thereto. Deliver to the Design Professional all certificates of inspection issued by authorities having jurisdiction.
- B. Water tap fees, meter fees, and all other charges for work under Division 21, including charges for meter installation and excess service by the utilities shall be paid by the Contractor.

1.9 SAFETY

- A. OSHA Requirements applicable to the project shall be complied with at all times.
- B. Manufacturer's Safety Instructions shall be followed in all instances.

- C. Asbestos Containing Materials (ACM) shall not be used on this project.
- D. Electrical Equipment Clearances: Piping, equipment and other mechanical installations shall not be located within 42" of the front or 36" of the side of any electrical switchboards, panel-boards, power panels, motor control centers, electrical transformers or similar electrical equipment. Piping and ductwork shall not pass through or above electrical equipment rooms except as required to serve those rooms.

1.10 PROTECTION OF FIRE SUPPRESSION SYSTEMS DURING CONSTRUCTION

- A. Material storage
 - 1. All materials and equipment stored on the jobsite shall be elevated above the ground and stored under suitable weather cover. Materials and equipment shall not be situated in areas subjected to localized flooding.
 - 2. Manufacturer's original shipping packaging and protective coverings shall be left in place until the equipment is prepared for installation.
- B. Electrical enclosure protection
 - 1. During construction, all protective covers and other devices shall be left in place that protect against inadvertent contact with live electrical circuits.
 - 2. All warning labels related to electrical and rotating equipment hazards shall be in place prior to energizing mechanical equipment circuits.
- C. Protection of Equipment and piping
 - 1. Maintain temporary closures on the ends of all equipment and pipes as the installation work progresses. Temporary closures include plastic sheeting, tape and appropriate caps and covers.
 - 2. Where debris enters piping during installation, steps shall be taken to clean the interior of the pipe prior to placing in service.
 - 3. Where debris enters equipment during installation the equipment interior shall be cleaned prior to placing in service.

1.11 CODES AND STANDARDS

- A. Mechanical installations shall conform to the current edition of the following, in addition to any previously mentioned Codes and Standards.
 - 1. The International Building Code 2018 Edition with Georgia State Amendments.
 - 2. The International Fire Protection Code 2018 Edition with Georgia State Amendments.
 - 3. NFPA Standard 70, National Electric Code 2017 Edition.
 - 4. NFPA Standard 101, Code for Safety to Life for Fire in Buildings and Structures 2018 Edition with Georgia State Amendments.
 - 5. Georgia State Minimum Fire Safety Standards Chapter 120-3-3 2020 Edition.
 - 6. NFPA Standard 13, Installation of Sprinkler Systems, 2019 edition.

1.12 ASBESTOS MATERIALS

- A. Contractor is advised there may be **ASBESTOS PRODUCTS** in building(s) which will affect work under this Project. Particular reference is made to piping, equipment and other items that may be modified or removed. It shall be the sole responsibility of Contractor to check for and ascertain presence of asbestos materials where such presence affects work under this Project. Where Contractor ascertains presence of asbestos materials, he shall notify Owner and Engineer in writing of presence of asbestos **BEFORE** beginning any work. Removal of asbestos products shall be the responsibility of Owner **AFTER** he has been notified by Contractor of its presence.

- B. Engineer assumes no responsibility of investigating for presence of **ASBESTOS PRODUCTS** or for verifying presence of asbestos materials, nor does Engineer assume any responsibility for specifying, advising on, or supervising removal of any asbestos products. Contractor and Owner shall hold harmless Engineer in any matters involving presence of, or removal of, asbestos products.

1.13 INTERRUPTION OF EXISTING SERVICES

- A. Exercise care so as not to cut any existing utilities or services. Where an existing utility line or service line is cut it shall be repaired to "like-new" condition. Interruption of service shall not be made without prior written permission of the Owner.
- B. Fire suppression system must remain in service during construction. Arrange with the Owner well in advance of shutdowns required for tie-ins. Shutdowns shall be made after normal occupancy hours if so directed by the Owner. No additional monies will be paid for after-hours shutdowns.

PART 2 - PRODUCTS Not required for this section.

PART 3 - EXECUTION Not required for this section.

END OF SECTION 21 00 00

DIVISION 21 – FIRE PROTECTION
SECTION 21 05 00 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes the following basic mechanical materials and methods to complement other Division 21 Sections.
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Field-fabricated metal equipment supports.
 - 3. Installation requirements common to equipment specification Sections.
 - 4. Mechanical demolition.
 - 5. Cutting and patching.
 - 6. Touchup painting and finishing.
- B. Pipe and pipe fitting materials are specified in piping system Sections.

1.3 DEFINITIONS

- A. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.
- B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- F. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract.
- B. Product data for following piping specialties:
 - 1. Mechanical sleeve seals.
 - 2. Identification materials and devices.
- C. Samples of color, lettering style, and other graphic representation required for each identification material and device.
- D. Shop drawings detailing fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

- E. Coordination drawings for access panel and door locations.
- F. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

- A. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code--Steel."
- B. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.
- C. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- D. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.
- E. Coordinate all electrical service requirements for mechanical equipment prior to the submittal of shop drawings. Confirm the compatibility of all power services with the equipment being furnished. Confirm compatibility of electrical lugs being provided by the equipment manufacturer with the power wiring being furnished under Division 26. Furnish written documentation that all characteristics have been coordinated with and confirmed by the electrical subcontractor.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.
- B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.
- C. Protect flanges, fittings, and piping specialties from moisture and dirt.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

- E. Coordinate connection of electrical services.
- F. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces.
- H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS

- A. Refer to individual piping system specification Sections for pipe and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- A. Refer to individual piping system specification Sections in Division 21 for special joining materials not listed below.
- B. Pipe Flange Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch minimum thickness, except where thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125 cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250 cast-iron and steel flanges.
 - 2. ASME B16.20 for grooved, ring-joint, steel flanges.
 - 3. AWWA C110, rubber, flat face, 1/8 inch thick, except where other thickness is indicated; and full-face or ring type, except where type is indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, except where other material is indicated.
- D. Solder Filler Metal: ASTM B 32.
 - 1. Alloy Sn95 or Alloy Sn94: Tin (approximately 95 percent) and silver (approximately 5 percent), having 0.10 percent lead content.
- E. Brazing Filler Metals: AWS A5.8.
 - 1. BCuP Series: Copper-phosphorus alloys.
 - 2. BAg1: Silver alloy.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon steel bolts and nuts.
- H. Couplings: Iron body sleeve assembly, fabricated to match outside diameters of plain-end pressure pipes.
 - 1. Sleeve: ASTM A 126, Class B, gray iron.

2. Followers: ASTM A 47, Grade 32510 or ASTM A 536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

2.3 PIPING SPECIALTIES

- A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type where required to conceal protruding fittings and sleeves.
1. Inside Diameter: Closely fit around pipe, tube, and insulation.
 2. Outside Diameter: Completely cover opening.
 3. Cast Brass: One-piece, with set-screw.
 - a. Finish: Rough brass.
 - b. Finish: Polished chrome plate.
 4. Cast Brass: Split casting, with concealed hinge and set-screw.
 - a. Finish: Rough brass.
 - b. Finish: Polished chrome plate.
 5. Stamped Steel: One-piece, with set-screw and chrome-plated finish.
 6. Stamped Steel: One-piece, with spring clips and chrome-plated finish.
 7. Stamped Steel: Split plate, with concealed hinge, set-screw, and chrome-plated finish.
 8. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
 9. Stamped Steel: Split plate, with exposed-rivet hinge, set-screw, and chrome-plated finish.
 10. Stamped Steel: Split plate, with exposed-rivet hinge, spring clips, and chrome-plated finish.
 11. Cast-Iron Floor Plate: One-piece casting.
- B. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
1. Steel Sheet-Metal: 24-gage or heavier galvanized sheet metal, round tube closed with welded longitudinal joint.
 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 3. Cast-Iron: Cast or fabricated wall pipe equivalent to ductile-iron pressure pipe, having plain ends and integral water stop, except where other features are specified.
 4. Wall Penetration Systems: Wall sleeve assembly, consisting of housing, gaskets, and pipe sleeve, with 1 mechanical-joint end conforming to AWWA C110 and 1 plain pipe-sleeve end.
 - a. Penetrating Pipe Deflection: 5 percent without leakage.
 - b. Housing: Ductile-iron casting having water-stop and anchor ring, with ductile-iron gland, steel studs and nuts, and rubber gasket conforming to AWWA C111, of housing and gasket size as required to fit penetrating pipe.
 - c. Pipe Sleeve: AWWA C151, ductile-iron pipe.
 - d. Housing-to-Sleeve Gasket: Rubber or neoprene push-on type of manufacturer's design.
 5. Cast-Iron Sleeve Fittings: Commercially made sleeve having an integral clamping flange, with clamping ring, bolts, and nuts for membrane flashing.
 - a. Underdeck Clamp: Clamping ring with set-screws.

2.4 FIRE-STOPPING

- A. Fire-Resistant Sealant: Provide UL Listed firestopping system for filling openings around penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS--COMMON REQUIREMENTS

- A. General: Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 21 specify piping installation requirements unique to the piping system.
- B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.
- C. Install piping at indicated slope.
- D. Install components having pressure rating equal to or greater than system operating pressure.
- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.
- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.
- H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install fittings for changes in direction and branch connections.
- L. Install couplings according to manufacturer's printed instructions.
- M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, suspended ceilings, cabinet interiors and other exposed locations, according to the following:
 - 1. Chrome-Plated Piping: Cast-brass, one-piece, with set-screw, and polished chrome-plated finish. Use split-casting escutcheons, where required, for existing piping.
 - 2. Un-insulated Piping Wall Escutcheons: Cast-brass or stamped-steel, with set-screw.
 - 3. Un-insulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
 - 4. Insulated Piping: Cast-brass or stamped-steel, with concealed hinge, spring clips, and chrome-plated finish.
 - 5. Piping in Utility Areas: Cast-brass or stamped-steel, with set-screw or spring clips.
- N. Install sleeves for pipes passing through concrete and masonry walls, concrete floor and roof slabs, exterior walls and where indicated.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring where specified.
 - 2. Build sleeves into new walls and slabs as work progresses.
 - 3. Install large enough sleeves to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than 6 inches.

- b. Steel Sheet-Metal Sleeves: For pipes 6 inches and larger that penetrate gypsum-board partitions.
- c. Cast-Iron Sleeve Fittings: For floors having membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Flashing is specified in other Division sections.
 - 1) Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.
- 4. Except for below-grade wall penetrations, seal annular space between sleeve and pipe or pipe insulation in non-rated floors and partitions, using elastomeric joint sealants. EXCEPTION: Fire rated partition penetrations shall be sealed with U.L. Listed firestopping systems.
- O. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with U.L. Listed firestopping sealant system.
- P. Verify final equipment locations for roughing in.
- Q. Refer to equipment specifications in other Sections for roughing-in requirements.
- R. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system Sections.
 - 1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 - 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - 3. Soldered Joints: Construct joints according to AWS "Soldering Manual," Chapter 22 "The Soldering of Pipe and Tube."
 - 4. Brazed Joints: Construct joints according to AWS "Brazing Manual" in the "Pipe and Tube" chapter.
 - 5. 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 inside diameter. Join pipe fittings and valves as follows:
 - a. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - b. Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).
 - c. Align threads at point of assembly.
 - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
 - e. Damaged Threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
 - 6. Welded Joints: Construct joints according to AWS D10.12 "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe" using qualified processes and welding operators according to the "Quality Assurance" Article.
 - 7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
- S. Piping Connections: Except as otherwise indicated, make piping connections as specified below.
 - 1. Install unions in piping 2 inches and smaller adjacent to each valve and at final connection to each piece of equipment having a 2-inch or smaller threaded pipe connection.
 - 2. Install flanges in piping 2-1/2 inches and larger adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
 - 3. Install dielectric unions and flanges to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION--COMMON REQUIREMENTS

- A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Design Professional.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.
- D. Install equipment giving right-of-way to piping systems installed at a required slope.

3.3 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1 "Structural Welding Code--Steel."

3.4 DEMOLITION

- A. Disconnect, demolish, and remove work specified under Division 21 and as indicated.
- B. Where pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety. Cap existing piping and ductwork that remains in place.
- D. Abandoned Work: Cut and remove pipe abandoned in place, 2 inches beyond the face of adjacent construction. Cap piping and patch surface to match existing finish.
- E. Removal: Remove indicated equipment, piping and ductwork from the Project site unless noted otherwise.
- F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.
- G. Remove all hangers, supports and anchors associated with mechanical items be removed. Patch surfaces to match adjacent finishes.

3.5 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of the trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

END OF SECTION 21 05 00

DIVISION 21 – FIRE PROTECTION
SECTION 21 05 19 - GAGES FOR FIRE PROTECTION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes gages used in fire protection systems.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract.
- B. Product data for each type of gage and fitting specified. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit a meter and gage schedule showing manufacturer's figure number, scale range, location, and accessories for each meter and gage.

1.4 QUALITY ASSURANCE

- A. Comply with applicable portions of American Society of Mechanical Engineers (ASME) and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gages.
- B. Design Criteria: The Drawings indicate types, sizes, capacities, ranges, profiles, connections, and dimensional requirements of meters and gages and are based on the specific manufacturer types and models indicated. Meters and gages having equal performance characteristics by other manufacturers may be considered, provided that deviations do not change the design concept or intended performance as judged by the Design Professional. The burden of proof for equality of meters and gages is on the proposer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Pressure Gages:
 - a. AMETEK, U.S. Gauge Div.
 - b. Ashcroft by Dresser Industries, Instrument Div.
 - c. Marsh Instrument Co.
 - d. Marshalltown Instruments, Inc.
 - e. H.O. Trerice Co.
 - f. Weiss Instruments, Inc.
 - g. Weksler Instruments Corp.
 - h. WIKA Instruments Corp.

2.2 PRESSURE GAGES

- A. Description: ASME B40.1, Grade A phosphor-bronze Bourdon-tube pressure gage, with bottom connection.
- B. Case: Drawn steel, brass, or aluminum with 4-1/2-inch -diameter glass lens.
- C. Connector: Brass, 1/4-inch.
- D. Scale: White-coated aluminum, with permanently etched markings.
- E. Accuracy: Plus or minus 1 percent of range span.
- F. Range: Conform to the following:
 - 1. Fluids Under Pressure: 2 times operating pressure.

2.3 PRESSURE-GAGE ACCESSORIES

- A. Isolation valve: Brass full port ball valve..

PART 3 - EXECUTION

3.1 GAGE APPLICATIONS

- A. General: Where indicated, install meters and gages of types, sizes, capacities, and with features indicated.

3.2 GAGE INSTALLATION, GENERAL

- A. Install gages and accessories according to manufacturers' written instructions for applications where used.

3.3 PRESSURE GAGE INSTALLATION

- A. Install pressure gages in piping tee with pressure gage located on pipe at most readable position.
- B. Install ball valve upstream of pressure gage inlet.
- C. Install in locations shown on plans and as required by NFPA codes.
- D. Install in the following locations and elsewhere as indicated:
 - 1. At floor control valves.

3.4 CONNECTIONS

- A. Piping installation requirements are specified in other Division 21 Sections. The Drawings indicate the general arrangement of piping, fittings, and specialties.
- B. Install gages adjacent to machines and equipment to allow servicing and maintenance.

3.5 ADJUSTING AND CLEANING

- A. Adjusting: Adjust faces of gages to proper angle for best visibility.

- B. Cleaning: Clean windows of gages and factory-finished surfaces. Replace cracked and broken windows and repair scratched and marred surfaces with manufacturer's touchup paint.

END OF SECTION 21 05 19

DIVISION 21 – FIRE PROTECTION
SECTION 21 05 29 - HANGERS AND SUPPORTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes hangers and supports for fire suppression piping and equipment.

1.3 DEFINITIONS

- A. Terminology used in this Section is defined in MSS SP-90.

1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract.
- B. Product data for each type of hanger and support.
- C. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- D. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.

1.5 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code--Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."
- C. NFPA Compliance: Comply with NFPA 13 for hangers and supports used as components of fire protection systems.
- D. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA.
 - 1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.
- E. Licensed Operators: Use operators that are licensed by powder-operated tool manufacturers to operate their tools and fasteners.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.
 - 1. Components include galvanized coatings or alternate rust preventing shop coating.
 - 2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Thermal-Hanger Shield Inserts: 100-psi average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.
- C. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.
- D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

2.2 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36, steel plates, shapes, and bars, black and galvanized.
- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.
- C. Washers: ASTM F 844, steel, plain, flat washers.
- D. Grout: ASTM C 1107, Grade B, non-shrink, nonmetallic.
 - 1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is non-staining, noncorrosive, non-gaseous and is recommended for both interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Water: Potable.
 - 4. Packaging: Premixed and factory-packaged.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger requirements are specified in the Section specifying the equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.2 HANGER AND SUPPORT INSTALLATION

- A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.

- C. Install supports with maximum spacings complying with MSS SP-69.
- D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
- E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.
- F. Install concrete inserts in new construction prior to placing concrete.
- G. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.
- H. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.
- I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- J. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- K. Support all piping direct from structure and independent of other piping.
- L. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- M. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.
- O. Insulated Piping: Comply with the following installation requirements.
 - 1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.
 - 2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.
 - 3. Shields: Install MSS Type 40, protective shields on insulated piping. Shields span an arc of 180 degrees and have dimensions in inches not less than the following:

	LENGTH	THICKNESS
<u>NPS (Inches)</u>	<u>(Inches)</u>	<u>(Inches)</u>
1/4 to 3-1/2	12	0.048
4	12	0.060
5 and 6	18	0.060
8 to 14	24	0.075
16 to 24	24	0.105

4. Pipes 6 Inches and Larger: Include shield inserts.
5. Insert Material: Length at least as long as the protective shield.
6. Thermal-Hanger Shields: Install with insulation of same thickness as piping.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.
- B. Grouting: Place grout under supports for equipment, and make a smooth bearing surface.

3.4 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without under-cut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

- A. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.
- C. Paint all exposed steel surfaces with one coat of primer and two coats of enamel.

END OF SECTION 21 05 29

DIVISION 21 – FIRE PROTECTION
SECTION 21 05 53 - IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Hydraulic data Signs.
 2. Pipe labels.
 3. Valve tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 HYDRAULIC DATA SIGNS

- A. Hydraulic Data Signs for Riser Valves, Alarm Check Valves and Floor Control Valves:
1. Material and Thickness: Aluminum sign with a minimum thickness of 0.020-inch (21 gauge) and having predrilled holes for mounting.
 2. Information Box Color: White UV resistant ink.
 3. Background Color: Red UV resistant ink.
 4. Maximum Temperature: Able to withstand temperatures up to 212 deg F.
 5. Minimum Label Size: Length and width vary for required label content, but not less than 5 by 7 inches.
 6. Include the following information:
 - a. Location
 - b. Number of sprinklers.
 - c. Density (gpm/sq.ft.)
 - d. Design area (sq.ft.)
 - e. Gpm discharge (gpm).
 - f. Residual pressure (psi)
 - g. Hose stream allowance (gpm).
 - h. Occupancy classification.

2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service.
- B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

- C. Pipe Label Contents: Include identification of piping service.
 - 1. Lettering Size: Size letters according to ASME A13.1 for piping.

2.3 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1.5-inch letters.
 - 1. Material: 3/32-inch-thick plastic laminate with black surfaces and a white inner layer.
 - 2. Material: Manufacturer's standard solid plastic.
 - 3. Size: 6 by 3 inches.
 - 4. Shape: Rectangular.
 - 5. Fasteners: Suspend from valve with metal chain.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surface of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

- 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 locations of access panels and doors.
- C. Install identifying devices before installing acoustic ceilings and similar concealment.
- D. Relocate mechanical identification materials and devices that have become visually blocked by the work of this or other Divisions.

3.3 HYDRAULIC DATA SIGN INSTALLATION

- A. Provide sign at each system riser valve, alarm check valve, and floor control valve to provide hydraulic data for information for each sprinkler zone served by the corresponding valve.
- B. Install sign on wall adjacent to valve or suspend sign from a chain attached to the valve.

3.4 FIRE DEPARTMENT CONNECTION SIGN INSTALLATION

- A. Where fire department connections are wall mounted, provide sign above each fire department connection. Where fire department connections are obscured by equipment or shrubbery, install sign at least six above grade and include an arrow on the sign pointing down towards the fire department connection. Anchor sign to wall with corrosion resistant screws or anchors.
- B. Where fire department connections are free standing, anchor sign to riser pipe with corrosion resistant hardware.

3.5 FIRE PUMP TEST HEADERS SIGNS INSTALLATION

- A. Provide sign above each fire pump test header. Anchor sign to wall with corrosion resistant screws or anchors.

3.6 EQUIPMENT LABEL INSTALLATION

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

3.7 PIPE LABEL INSTALLATION

- A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 3. Near major equipment items and other points of origination and termination.
 - 4. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
- B. Pipe Label Color:
 - 1. Background: Safety red.
 - 2. Letter Colors: White.

3.8 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems.

END OF SECTION 21 05 53

DIVISION 21 – FIRE PROTECTION
SECTION 21 05 60 - FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes fire-suppression piping and equipment for the following building systems:
 - 1. Wet-pipe, fire-suppression sprinklers, including piping, valves, specialties, and automatic sprinklers.

1.3 DEFINITIONS

- A. Working Plans: Documents, including drawings, calculations, and material specifications prepared according to NFPA 13 for obtaining approval from authorities having jurisdiction.
- B. Q.R.: Quick response.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Design sprinklers and obtain approval from authorities having jurisdiction.
- B. Design sprinkler piping according to the following and obtain approval from authorities having jurisdiction:
 - 1. Include 10 psi margin of safety for available water pressure.
 - 2. Include losses through water-service piping, valves, and backflow preventers.
 - 3. Sprinkler Occupancy Hazard Classifications: As follows:
 - a. Building Service Areas: Ordinary Hazard, Group 1.
 - b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
 - c. General Storage Areas: Ordinary Hazard, Group 1.
 - d. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
 - e. Public Areas: Light Hazard.
 - f. Classrooms: Light Hazard.
 - 4. Minimum Density for Automatic-Sprinkler Piping Design: As follows:
 - a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area. Area may be reduced as permitted by NFPA 13.
 - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500- sq. ft. area. Area may be reduced as permitted by NFPA 13.
 - c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500- sq. ft area. Area may be reduced as permitted by NFPA 13.
- C. Components and Installation: Capable of producing piping systems with 175-psig (1200-kPa) minimum working-pressure rating, unless otherwise indicated.

1.5 SUBMITTALS

- A. Product Data: For the following:

1. Pipe and fitting materials and methods of joining for sprinkler piping.
 2. Pipe hangers and supports.
 3. Valves, including specialty valves, accessories, and devices.
 4. Alarm devices. Include electrical data.
 5. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.
- B. Fire-Hydrant Flow Test Report: As specified in "Preparation" Article.
- C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction. Include hydraulic calculations, if applicable.
- D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- E. Maintenance Data: For each type of sprinkler specialty to include in maintenance manual.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has designed and installed fire-suppression piping similar to that indicated for this Project and obtained design approval and inspection approval from authorities having jurisdiction.
- B. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL's "Fire Protection Equipment Directory" and FM's "Fire Protection Approval Guide" and that comply with other requirements indicated.
- C. Standpipe and Sprinkler Components: Listing/approval stamp, label, or other marking by a testing agency acceptable to authorities having jurisdiction.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- E. NFPA Standards: Equipment, specialties, accessories, installation, and testing complying with the following:
1. NFPA 13, "Installation of Sprinkler Systems."

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Sprinkler Cabinets: Finished, wall-mounting steel cabinet and hinged cover, with space for a minimum of six spare sprinklers plus sprinkler wrench. Include the number of sprinklers required by NFPA 13 and wrench for sprinklers. Include separate cabinet with sprinklers and wrench for each type of sprinkler on Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, incorporate Products from the following manufacturers into the Work:

1. Specialty Valves and Devices:
 - a. Anvil International
 - b. Globe Fire Sprinkler Corp.
 - c. Reliable Automatic Sprinkler Co., Inc.
 - d. Viking Corp.
 - e. Tyco

2. Water-Flow Indicators and Supervisory Switches:
 - a. Anvil International
 - b. Gamewell Co.
 - c. System Sensor Div.
 - d. Potter Electric Signal Co.
 - e. Reliable Automatic Sprinkler Co., Inc.
 - f. Viking Corp.

3. Sprinkler, Drain and Alarm Test Fittings:
 - a. AGF Manufacturing
 - b. Globe Fire Sprinkler Corp.
 - c. Reliable
 - d. Smith-Cooper International; FPPI Div.
 - e. Viking Corp.

4. Sprinkler, Inspector's Test Fittings:
 - a. AGF Manufacturing
 - b. Globe Fire Sprinkler Corp.
 - c. Reliable
 - d. Smith-Cooper International; FPPI Div.
 - e. Viking Corp.

5. Electrically Operated Alarm Bell:
 - a. Fire Lite Alarms, Inc.; a Honeywell company
 - b. Notifier, a Honeywell company
 - c. Potter Electric Signal Company

6. Sprinklers:
 - a. Globe Fire Sprinkler Corp.
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Viking Corp.
 - d. Tyco

7. Fire-Protection-Service Valves:
 - a. Anvil International
 - b. Grinnell.
 - c. Mueller
 - d. Nibco, Inc.
 - e. Stockham Valves & Fittings, Inc.
 - f. Victaulic Co. of America

8. Keyed Couplings for Steel Piping:
 - a. Anvil International
 - b. Grinnell
 - c. Gruvlok
 - d. Star Pipe Products, Inc.
 - e. Victaulic Co. of America.

9. Automatic Air Venting Device:
 - a. AGF Manufacturing
 - b. Globe Fire Sprinkler Corp.
 - c. Potter Signal
 - d. Reliable
 - e. Viking Corp

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 PIPES AND TUBES

- A. Standard-Weight Steel Pipe: ASTM A 53, ASTM A 135, or ASTM A 795; Schedule 40 in NPS 2 (DN150) and smaller.
- B. Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 2-1/2 and larger.
- C. Stainless Steel Tubing: UL listed, one-piece flexible tubing system. System assembly shall include couplings and ceiling grid mounting hardware; piping assembly shall be designed for connecting branch piping to sprinklers and mounting sprinklers in ceiling.

2.4 PIPE AND TUBE FITTINGS

- A. Cast-Iron Threaded Flanges: ASME B16.1.
- B. Cast-Iron Threaded Fittings: ASME B16.4.
- C. Malleable-Iron Threaded Fittings: ASME B16.3.
- D. Steel, Threaded Couplings: ASTM A 865.
- E. Steel Welding Fittings: ASTM A 234/A 234M, ASME B16.9, or ASME B16.11.
- F. Steel Flanges and Flanged Fittings: ASME B16.5.
- G. Steel, Grooved-End Fittings: UL-listed and FM-approved, ASTM A 47 (ASTM A 47M), malleable iron or ASTM A 536, ductile iron; with dimensions matching steel pipe and ends factory grooved according to AWWA C606.

2.5 JOINING MATERIALS

- A. Refer to other Division 21 sections for pipe-flange gasket materials and welding filler metals.

- B. Steel, Keyed Couplings: UL 213 and AWWA C606, for steel-pipe dimensions. Include ASTM A 536, ductile-iron housing, rubber gaskets, and steel bolts and nuts. Include listing for dry-pipe service for couplings for dry piping.
- C. Transition Couplings: AWWA C219, sleeve type, or other manufactured fitting the same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

2.6 FIRE-PROTECTION-SERVICE VALVES

- A. General: UL Listed and FM approved, with minimum 175-psig non-shock working-pressure rating. Valves for grooved-end piping may be furnished with grooved ends instead of type of ends specified.
- B. Indicating Valves, NPS 4 and Smaller: UL 1091; butterfly or ball-type, bronze or steel body with threaded or grooved ends; open-or-closed position indicator; and integral tamper switch.
 - 1. Tamper Indicating Switch: Electrical, prewired, supervisory switch. Coordinate requirements with fire alarm system.
- C. Gate Valves, NPS 2 and Smaller: UL 262; cast-bronze, threaded ends; solid wedge; OS&Y; and rising stem. Include tamper indicating switch.
 - 1. Tamper Indicating Switch: Electrical, prewired, supervisory switch. Coordinate requirements with fire alarm system.
- D. Gate Valves, NPS 2-1/2 and Larger: UL 262, iron body, bronze mounted, taper wedge, OS&Y, and rising stem. Include replaceable, bronze, wedge facing rings and flanged ends. Include tamper indicating switch.
 - 1. Tamper Indicating Switch: Electrical, prewired, supervisory switch. Coordinate requirements with fire alarm system.
- E. Swing Check Valves: UL Listed & FM Approved; MSS SP-80; Class 125, 200-psi CWP, or Class 150, 300-psi CWP; horizontal swing, Y-pattern, ASTM B 62 cast-bronze body and cap, rotating bronze disc with rubber seat or composition seat, threaded or soldered end connections. Check valve shall have removable cover for servicing.
- F. Swing Check Valves: MSS SP-71, Class 125, 200-psi CWP, ASTM A 126 cast-iron body and bolted cap, horizontal-swing bronze disc, flanged or grooved end connections. Check valve shall have removable cover for servicing.

2.7 SPRINKLERS

- A. Automatic Sprinklers:
 - 1. Heat-responsive element complying with UL199.
 - 2. Intermediate heat-responsive element, unless otherwise indicated or required by application.
- B. Sprinkler types, features, and options include the following:
 - 1. Pendent, dry-type sprinklers.
 - 2. Quick-response sprinklers.
 - 3. Recessed sprinklers, including escutcheon.

4. Sidewall sprinklers.
 5. Sidewall, dry-type sprinklers.
 6. Upright sprinklers.
- C. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
1. Ceiling Mounting: Steel, white finish, one piece, flat.
 2. Sidewall Mounting: Steel, white finish, one piece, flat.
- D. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

2.8 SPECIALTY SPRINKLER FITTINGS

- A. Specialty Fittings: UL Listed and FM approved; made of steel, ductile iron, or other materials compatible with piping.
- B. Dry-Pipe-System Fittings: UL listed for dry-pipe service.
- C. Mechanical-T Fittings: UL 213, ductile-iron housing with pressure-responsive gasket, bolts, and threaded or locking-lug outlet.
- D. Mechanical-Cross Fittings: UL 213, ductile-iron housing with pressure-responsive gaskets, bolts, and threaded or locking-lug outlets.
- E. Drop-Nipple Fittings: UL 1474, with threaded inlet, threaded outlet, and seals; adjustable.
- F. Sprinkler, Inspector's Test Fittings: UL-listed, cast- or ductile-iron housing; with threaded inlet and drain outlet and sight glass.

2.9 SPRINKLER INSPECTOR'S TEST FITTINGS WITH INTEGRAL PRESSURE RELIEF AND DRAIN

- A. Standard: UL or FM Global, listing. NFPA 13.
- B. Pressure Rating: 300 psig.
- C. Body Material: Bronze body, brass stem, steel handle, chrome-plated bronze ball, virgin teflon valve seat; sight glass viewing window; A tamper resistant test orifice and a tapped port for system access.
- D. Pressure Relief Valve and Drainage Piping:
1. Body Material: Bronze body and stainless-steel spring.
 2. Components: Nylobraid flexible tube, One 1/2 inch NPT by barbed 90 degree elbow, one 1/2" NPT by barbed straight adapter, external identification plate and integral flushing handle to remove debris
 3. Relief pressure shall be factory set to project specifications.
 4. Relief valve shall operate to the OPEN position between 90% and 105% of the set pressure.
 5. Relief valve shall reseal or CLOSE at a minimum of 80% of set pressure.
- E. Inlet and Outlet: Threaded.

2.10 ALARM DEVICES

- A. General: Types matching piping and equipment connections.
- B. Electrically Operated Alarm Bell:
 - 1. Standard: UL464
 - 2. Type: Vibrating, metal alarm bell.
 - 3. Size: 6-inch minimum diameter.
 - 4. Finish: Red-enamel factory finish, suitable for outdoor use.
- C. Water-Flow Indicators: UL 346; electrical-supervision, vane-type water-flow detector; with 250-psig pressure rating; and designed for horizontal or vertical installation. Include two single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
- D. Valve (Tamper) Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

2.11 AIR VENTING DEVICE

- A. Product: Device which automatically vents air from wet pipe sprinkler system..
 - 1. Standard: UL or FM Global, listing. NFPA 13.
 - 2. Pressure Rating: 300 psig, 175 psi for air vent.
 - 3. Body Material: Forged brass body.
 - 4. Components: Ball valve, stainless steel strainer, purge valve with hose connection, thread cap with lanyard, automatic air vent.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article in Part 1 of this Section.
- B. Report test results promptly and in writing.

3.2 PIPING APPLICATIONS

- A. Do not use welded joints with galvanized steel pipe.
- B. Flanges, unions, and transition and special fittings with pressure ratings the same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.
- C. Wet-Pipe Sprinklers: Use the following:
 - 1. NPS 1-1/4 and larger: Schedule 10 steel pipe with roll-grooved ends; steel, grooved-end fittings; and grooved joints.
 - 2. NPS 2 and Smaller: Standard-weight steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints.
 - 3. NPS 1-1/4 and larger: Schedule 10 steel pipe with plain ends, steel welding fittings, and welded joints.

3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Fire-Protection-Service Valves: UL Listed and FM approved for applications where required by NFPA 13.
 - a. Shutoff Duty: Use indicating valves.
 - 2. General-Duty Valves: For applications where UL-listed and FM-approved valves are not required by NFPA 13.
 - a. Shutoff Duty: Use ball, or butterfly valves.
 - b. Throttling Duty: Use ball, or butterfly valves.

3.4 JOINT CONSTRUCTION

- A. Refer to other Division 21 sections for basic piping joint construction.
- B. Steel-Piping, Grooved Joints: Use Schedule 40 steel pipe with cut or roll-grooved ends and Schedule 30 or thinner steel pipe with roll-grooved ends; steel, grooved-end fittings; and steel, keyed couplings. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions. Use gaskets listed for dry-pipe service for dry piping.
- C. Dissimilar-Piping-Material Joints: Construct joints using adapters or couplings compatible with both piping materials. Use dielectric fittings if both piping materials are metal. Refer to other Division 21 sections for dielectric fittings.

3.5 WATER-SUPPLY CONNECTION TO EXISTING PIPING

- A. Connect piping to existing sprinkler supply piping.

3.6 PIPING INSTALLATION

- A. Refer to other Division 21 sections for basic piping installation.
- B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with the Design Professional before deviating from approved working plans.
- C. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.
- E. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections.
- F. Install "Inspector's Test Connections" in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13.

- G. Install sprinkler piping with drains for complete system drainage.
- H. Install pressure relief valves. Route pressure relief valve outlet to system drain piping.
- I. Install sprinkler zone control valves, test assemblies, and drain risers.
- J. Install alarm devices in piping systems.
- K. Hangers and Supports: Comply with NFPA 13 for hanger materials. Install according to NFPA 13 for sprinkler piping.
- L. Install piping with grooved joints according to manufacturer's written instructions. Construct rigid piping joints, unless otherwise indicated.
- M. Install flexible stainless-steel tubing systems in accordance with the manufacturer's instructions.
- N. Install pressure gages on riser or feed main, at each sprinkler test connection, and at floor control valve. Include pressure gages with connection not less than NPS 1/4 (DN8) and with soft metal seated valve at inlet, arranged for draining pipe between gage and valve. Install gages to permit removal and install where they will not be subject to freezing.
- O. Install automatic air venting device at high point of wet pipe sprinkler systems.

3.7 SPECIALTY SPRINKLER FITTING INSTALLATION

- A. Install specialty sprinkler fittings according to manufacturer's written instructions.

3.8 VALVE INSTALLATION

- A. Refer to other Division 21 sections for installing general-duty valves. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA 13, manufacturer's written instructions, and authorities having jurisdiction.
- B. Indicating Valves: Install fire-protection-service valves supervised-open, located to control sources of water supply except from fire department connections. Provide permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection.

3.9 SPRINKLER APPLICATIONS

- A. General: Use sprinklers according to the following applications:
 - 1. Rooms without Ceilings: Q.R. upright sprinklers.
 - 2. Rooms with Suspended Ceilings: Q.R. recessed sprinklers.
 - 3. Wall Mounting: Q.R. sidewall sprinklers.
 - 4. Spaces Subject to Freezing: Upright; pendent, dry-type; and sidewall, dry-type sprinklers.
 - 5. Sprinkler Finishes: Use sprinklers with the following finishes:
 - a. Upright Sprinklers: Rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.
 - b. Recessed Sprinklers: Bright white, with bright white escutcheon.
 - c. Sidewall Sprinklers: Bright white with white escutcheon.

3.10 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical panels and tiles.
- B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space.

3.11 CONNECTIONS

- A. Connect water supplies to sprinklers.
- B. Connect piping to specialty valves, hose valves, specialties, and accessories.
- C. Electrical Connections: Power wiring is specified in Division 26.
- D. Connect alarm devices to fire alarm.

3.12 LABELING AND IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and in other Division 21 sections.

3.13 FIELD QUALITY CONTROL

- A. Flush, test, and inspect sprinkler piping according to NFPA 13, "System Acceptance" Chapter.
- B. Replace piping system components that do not pass test procedures and retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.
- C. Report test results promptly and in writing to the Design Professional and authorities having jurisdiction.

3.14 CLEANING

- A. Clean dirt and debris from sprinklers. Where adhesive materials such as paint and drywall mud have adhered to sprinklers, they shall be replaced entirely.
- B. Remove and replace sprinklers having paint other than factory finish.

3.15 PROTECTION

- A. Protect sprinklers from damage until Material Completion.

3.16 COMMISSIONING

- A. Verify that specialty valves, trim, fittings, controls, and accessories are installed and operate correctly.
- B. Verify that specified tests of piping are complete.
- C. Verify that damaged sprinklers and sprinklers with paint or coating not specified are replaced with new, correct type.
- D. Verify that sprinklers are correct types, have correct finishes and temperature ratings, and have guards as required for each application.

- E. Fill wet-pipe sprinkler piping with water.
- F. Energize circuits to electrical equipment and devices.
- G. Adjust operating controls and pressure settings.
- H. Coordinate with fire alarm tests. Operate as required.

3.17 DEMONSTRATION

- A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.
- B. Schedule demonstration with Owner with at least seven days' advance notice.

END OF SECTION 21 05 60

DIVISION 23 - HVAC
SECTION 230000 - GENERAL HVAC PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- B. This Section includes general provisions covering the contract documents for HVAC Systems.

1.3 DEFINITIONS

- A. Provide shall mean "Furnish, install and connect."
- B. HVAC shall mean "Heating, Ventilation and Air Conditioning."

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract.
- B. Electrical Coordination: In addition to submittal requirements of other Division 23 Sections, submit a document approved by the project Electrical Contractor certifying that all mechanical equipment being furnished under Division 23 complies with the electrical characteristics of the source power which will be furnished under Division 26.
- C. Extra Materials: Where specification sections call for extra materials (i.e., filters, etc.) submit a complete list of all such materials including total quantities and sizes for review. Delivered quantities will be verified at the completion of the project.
 - 1. Upon delivery of the extra materials to the Owner, an Owner's representative shall sign the materials list certifying receipt.
 - 2. The signed receipt shall be included in the closeout documents.
- D. Model numbers listed on the Mechanical Contract Documents shall not be construed to indicate electrical characteristics. Electrical characteristics of mechanical equipment shall be as indicated on the Electrical Contract Documents (Division 26).
- E. Review of Submittals does not relieve the Contractor of any of the requirements of the Contract Documents. Failure by the Engineer to document errors and omissions in the Contractor's submittals during the Engineer's submittal review does not constitute a waiver of any of the requirements of the original sealed Contract Documents.

1.5 CONTRACTOR QUALIFICATIONS

- A. HVAC Subcontractor shall have a current Class II (Non-restricted) Conditioned Air Contractors License for the state in which the project is being constructed. The Subcontractor shall have as part of the Firm a Service Department qualified to service all systems installed in the project or have a written agreement with a Service Agency qualified to provide such service. The Service Department or Agency shall be on call at all hours. The subcontractor shall have installed at least (within the last five years):

1. One heat recovery variable refrigerant flow system of at least 20-tons in size.
2. Three Dx system buildings of at least 100-tons total capacity with more than one system in excess of 5-tons

1.6 PRIOR APPROVALS

- A. **Manufacturers References:** When reference is made in the Contract Documents to trade names or specific manufacturers and/or models, such reference, unless noted otherwise, is made to designate and identify the quality of materials or equipment to be furnished and is not intended to restrict competitive bidding. If it is desired to use materials or equipment different from those indicated on the Contract Documents, written request for approval must reach the hands of the primary Design Professional at least TEN DAYS prior to the date set for the opening of bids. A copy of the request should also be sent directly to the Engineer. Requests for prior approval of a proposed substitute shall be accompanied by complete technical data supporting the request.

1.7 LAYOUT AND COORDINATION

- A. **Layout Basis:**
1. The equipment listed on the drawing schedules or in the technical specifications as “basis of design” or “owner preferred” has been used for the physical arrangement of the mechanical systems. When equipment listed as acceptable, equal or equipment which has received "prior approval" is used, it shall be the Contractor's responsibility to provide structural, ductwork, electrical, service clearances, or other changes required to accommodate the substituted equipment. Changes shall be made at no additional cost to the Owner. Submit a list of required changes along with all prior approval requests and shop drawing submittals.
 2. The Contract Drawings are intended to show the general arrangement of all mechanical work. They do not show in detail all offsets, fittings and transitions. Examine Drawings, investigate site conditions to be encountered and arrange work accordingly. Furnish all offsets and transitions required.
 3. Drawings do not indicate in detail exact configuration of connections for fixtures, equipment and accessories. Final connection shall be as shown on approved Manufacturer's Submittal Drawings. Where Manufacturer's Submittal Drawings conflict with the Contract Documents, confer with the Design Professional for resolution.
 4. Measurement of Drawings by scale shall not be used as dimensions for fabrication. Measurements for locating fixtures, equipment, ductwork, piping and other mechanical items shall be made on the site and shall be based on actual job conditions.
 5. Check space limitations and verify electrical requirements before ordering any mechanical equipment or materials. Place large equipment inside the building prior to the erection of exterior walls where equipment cannot enter finished building openings.
- B. **Coordination:** Mechanical work shall be coordinated with that of other trades to avoid conflict. The Contractor shall study all plans and specifications for this project and shall notify the Design Professional of any conflict between work under Division 23 and work under other divisions of the Project. Particular attention shall be given to interference between piping, electrical installations, structural systems, building openings and ductwork.
- C. **Installation Instructions:** Manufacturer's installation instructions for all equipment furnished under Division 23 shall be furnished by the Contractor. Instructions shall be maintained on the jobsite until the project is complete, and then turned over to the Owner.

- D. Operation and Maintenance Instructions: Electronic copies of equipment O&M manuals shall be submitted to the Owner a minimum of 15 days prior to equipment/systems training. An index document indicating project name, project number, building name and contents shall be included. Model and serial numbers of equipment shall be shown on the cover of their respective O&M manual(s). Warranty registration documentation shall be included where applicable, including documentation confirming warranties have been registered with the equipment manufacturer.

1.8 PERMITS

- A. Obtain all necessary Permits and Inspections required for the installation of this work and pay all charges incident thereto. Deliver to the Design Professional all certificates of inspection issued by authorities having jurisdiction.
- B. Sewer tap fees, water tap fees, meter fees, Dept. of Labor Fees for Boilers and Pressure Vessels and all other charges for work under Division 23, including charges for meter installation and excess service by the Gas Company or any other utilities shall be paid by the Contractor.

1.9 SAFETY

- A. OSHA Requirements applicable to the project shall be complied with at all times.
- B. Manufacturer's Safety Instructions shall be followed in all instances.
- C. Asbestos Containing Materials (ACM) shall not be used on this project.
- D. Refrigerants containing CFC's or HCFS's shall not be used on this project, nor shall any equipment using such refrigerants be incorporated into this project.
- E. Electrical Equipment Clearances: Piping, equipment and other mechanical installations shall not be located within 42" of the front or 36" of the side of any electrical switchboards, panelboards, power panels, motor control centers, electrical transformers or similar electrical equipment. Piping and ductwork shall not pass through or above electrical equipment rooms except as required to serve those rooms.

1.10 PROTECTION OF MECHANICAL SYSTEMS AND COMPONENTS DURING CONSTRUCTION

- A. Material storage:
 - 1. All materials and equipment stored on the jobsite shall be elevated above the ground and stored under suitable weather cover. Materials and equipment shall not be situated in areas subjected to localized flooding.
 - 2. Manufacturer's original shipping packaging and protective coverings shall be left in place until the equipment is prepared for installation.
- B. Electrical enclosure protection:
 - 1. During construction, all protective covers and other devices shall be left in place that protect against inadvertent contact with live electrical circuits.
 - 2. All warning labels related to electrical and rotating equipment hazards shall be in place prior to energizing mechanical equipment circuits.

- C. Protection of ducts and piping:
 - 1. Maintain temporary closures on the ends of all ducts and pipes as the installation work progresses. Temporary closures include plastic sheeting, tape and appropriate caps and covers.
 - 2. Where debris enters piping during installation, steps shall be taken to clean the interior of the pipe prior to placing it in service.
 - 3. Where debris enters ductwork during installation the duct interior shall be cleaned prior to placing in service.

- D. Operation of HVAC systems during construction:
 - 1. Although the operation of the permanent HVAC systems during the construction process is strongly discouraged, the Contractor shall take measures to protect the systems from contamination if they are operated.
 - 2. When placed in operation during the construction period, all HVAC systems shall have MERV 8 filtration in all standard filter racks throughout the systems. Where so equipped, final filter banks do not have to be in place.
 - 3. All return and outdoor air intake openings shall be protected with MERV 8 filter material at all points of entry into the duct system. These protections shall be maintained and remain in place until the building is prepared for final inspection.
 - 4. Prior to final acceptance of the building HVAC systems, the interior of all HVAC unit cabinets shall be thoroughly cleaned to “like-new” condition.

1.11 CODES AND STANDARDS

- A. Mechanical installations shall conform to the current edition (recognized by the State) of the following, in addition to any previously mentioned Codes and Standards.
 - 1. The International Building Code.
 - 2. The International Mechanical Code.
 - 3. The International Plumbing Code.
 - 4. The International Fire Protection Code.
 - 5. The State Energy Code.
 - 6. NFPA Standard 70, National Electric Code.
 - 7. NFPA Standard 90A, Installation of Air Conditioning and Ventilation Systems.
 - 8. NFPA Standard 101, Code for Safety to Life for Fire in Buildings and Structures.
 - 9. The FGI Guidelines for Design and Construction of Hospital and Healthcare Facilities.

1.12 ASBESTOS MATERIALS

- A. Contractor is advised there may be **ASBESTOS PRODUCTS** in building(s) which will affect work under this Project. Particular reference is made to piping, equipment and other items that may be modified or removed. It shall be the sole responsibility of Contractor to check for and ascertain presence of asbestos materials where such presence affects work under this Project. Where Contractor ascertains presence of asbestos materials, he shall notify Owner and Engineer in writing of presence of asbestos **BEFORE** beginning any work. Removal of asbestos products shall be the responsibility of Owner **AFTER** he has been notified by Contractor of its presence.

- B. Engineer assumes no responsibility of investigating for presence of **ASBESTOS PRODUCTS** or for verifying presence of asbestos materials, nor does Engineer assume any responsibility for specifying, advising on, or supervising removal of any asbestos products. Contractor and Owner shall hold harmless Engineer in any matters involving presence of, or removal of, asbestos products.

1.13 INTERRUPTION OF EXISTING SERVICES

- A. Exercise care so as not to cut any existing utilities or services. Where an existing utility line or service line is cut it shall be repaired to "like-new" condition. Interruption of service shall not be made without prior written permission of the Owner.
- B. Plumbing, Electrical and HVAC system must remain in service during construction. Arrange with the Owner well in advance of shutdowns required for tie-ins. Shutdowns shall be made after normal occupancy hours if so directed by the Owner. No additional monies will be paid for after-hours shutdowns.

PART 2 - PRODUCTS

Not required for this section.

PART 3 - EXECUTION

Not required for this section.

END OF SECTION 23 00 00

DIVISION 23 - HVAC
SECTION 23 05 00 – COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes the following basic mechanical materials and methods to complement other Division 23 Sections.
 - 1. Mechanical demolition.
 - 2. Cutting and patching.
 - 3. Touchup painting and finishing.
- B. Pipe and pipe fitting materials are specified in piping system Sections.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract.
- B. Product data for following piping specialties:
 - 1. Mechanical sleeve seals.
- C. Samples of color, lettering style, and other graphic representation required for each identification material and device.
- D. Shop drawings detailing fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.
- E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

- A. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code--Steel."
- B. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.
- C. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.6 SEQUENCING AND SCHEDULING

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.
- E. Coordinate connection of electrical services.
- F. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces.
- H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 PIPING SPECIALTIES

- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
 - 1. Steel Sheet-Metal: 24-gage or heavier galvanized sheet metal, round tube closed with welded longitudinal joint.
 - 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 - 3. Cast-Iron: Cast or fabricated wall pipe equivalent to ductile-iron pressure pipe, having plain ends and integral water stop, except where other features are specified.
 - 4. Wall Penetration Systems: Wall sleeve assembly, consisting of housing, gaskets, and pipe sleeve, with 1 mechanical-joint end conforming to AWWA C110 and 1 plain pipe-sleeve end.

- a. Penetrating Pipe Deflection: 5 percent without leakage.
 - b. Housing: Ductile-iron casting having water-stop and anchor ring, with ductile-iron gland, steel studs and nuts, and rubber gasket conforming to AWWA C111, of housing and gasket size as required to fit penetrating pipe.
 - c. Pipe Sleeve: AWWA C151, ductile-iron pipe.
 - d. Housing-to-Sleeve Gasket: Rubber or neoprene push-on type of manufacturer's design.
5. Cast-Iron Sleeve Fittings: Commercially made sleeve having an integral clamping flange, with clamping ring, bolts, and nuts for membrane flashing.
- a. Underdeck Clamp: Clamping ring with set-screws.

2.2 IDENTIFYING DEVICES AND LABELS

- A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 23 Sections. Where more than one type is specified for listed application, selection is Installer's option, but provide single selection for each product category.
- B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped, permanently fastened to equipment.
 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
 2. Location: An accessible and visible location.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION--COMMON REQUIREMENTS

- A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Design Professional.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.
- D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
- E. Install equipment giving right-of-way to piping systems installed at a required slope.
- F. Equipment and appliances containing evaporators or cooling coils shall be installed with a means of condensate removal in compliance with IMC 307.2. A water level detection device conforming to UL 508 shall be provided for all main condensate pans and be interlocked to de-energize the unit's main fan should the drain pan water level exceed the main drainpipe connection level. Additional measures shall be taken where indicated on drawings or specifications.

3.2 LABELING AND IDENTIFYING

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Stenciled Markers: Complying with ASME A13.1.
 2. Plastic markers, with application systems. Install on pipe insulation segment where required for hot non-insulated pipes.
 3. Locate pipe markers wherever piping is exposed in finished spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums), and exposed exterior locations as follows:
 - a. Near each valve and control device.
 - b. Near each branch, excluding short take-offs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.
 - c. Near locations where pipes pass through walls, floors, ceilings, or enter inaccessible enclosures.
 - d. At access doors, manholes, and similar access points that permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
 - f. Spaced at a maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
 4. On piping above removable acoustical ceilings, provide as noted in the previous paragraph, except omit intermediately spaced markers.
- B. Valves: Provide tags on all valves provided under the project. Furnish a typed list of all tags to the Owner at project closeout.
- C. Equipment: Install engraved plastic laminate sign or equipment marker on or near each major item of mechanical equipment.
1. Lettering Size: Minimum 1/4-inch -high lettering for name of unit where viewing distance is less than 2 feet, 1/2-inch -high for distances up to 6 feet, and proportionately larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 of size of principal lettering.
 2. Text of Signs: Provide text to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to name of identified unit.
- D. Mark all above ceiling devices such as valves, fire dampers, pumps and HVAC equipment with signs located on the ceiling below.
- E. Duct Systems: Identify air supply, return, exhaust, intake, and relief ducts with duct markers; or provide stenciled signs and arrows, showing duct system service and direction of flow.
1. Location: In each space where ducts are exposed or concealed by removable ceiling system, locate signs near points where ducts enter into space and at maximum intervals of 50 feet.
- F. Adjusting: Relocate identifying devices which become visually blocked by work of this Division or other Divisions.

3.3 PAINTING AND FINISHING

- A. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.
- B. Paint all exposed steel surfaces of piping and supports with one coat of primer and two coats of enamel.

3.4 CONCRETE BASES

- A. Construct concrete equipment bases of dimensions indicated, but not less than 4 inches larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive strength concrete with 6 x 6 x #10 reinforcing wire mesh. Outdoor concrete bases shall extend a minimum of 4" above grade and be a minimum thickness of 6".

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1 "Structural Welding Code--Steel."

3.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.
- B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.7 DEMOLITION

- A. Disconnect, demolish, and remove work specified under Division 23 and as indicated.
- B. Where pipe, ductwork, insulation, or equipment that is designated to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Accessible Work: Remove indicated pipe and ductwork in its entirety. Cap existing piping and ductwork that remains in place.
- D. Abandoned Work: Cut and remove pipe designated to be abandoned in place, 2 inches beyond the face of adjacent construction. Cap piping and patch surface to match existing finish.
- E. Removal: Remove indicated equipment, piping and ductwork from the Project site unless noted otherwise.
- F. Where equipment is indicated to be demolished and removed, and utility runouts are not designated for re-use:
 - 1. Remove associated gas hydronic, steam and refrigerant runout piping from the equipment back to the branching point or source unit. Cap remaining pipe and reinsulate as required.
 - 2. Remove associated power wiring and raceway back to circuit protection device. Re-label circuit protection device.
 - 3. Remove associated control devices, and control wiring.
- G. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

- H. Where floor-mounted or ground-mounted equipment is removed, concrete pads shall be removed unless designated for re-use.
- I. Remove all hangers, supports and anchors associated with mechanical items being removed. Patch surfaces to match adjacent finishes.

3.8 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of the trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

3.9 GROUTING

- A. Install nonmetallic non-shrink grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms for placement of grout, as required.
- D. Avoid air entrapment when placing grout.
- E. Place grout to completely fill equipment bases.
- F. Place grout on concrete bases to provide a smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's printed instructions.

3.10 INSTALLATION OF PIPE-FREEZE PROTECTION HEATING CABLES (HEAT TRACE)

- A. Heating cables and accessories shall be provided by the manufacturer based on the specific requirements of the installation.
- B. Install all cables and accessories as instructed by the manufacturer, and in accordance with IEEE 515.1.
- C. Install insulation over piping with heating cables as specified in this and other sections.
- D. Apply warning tape and labels on piping insulation where heating cables are installed. Apply labels stamped "ELECTRIC TRACED" spaced no more than 10 feet on center.
- E. Set field-adjustable controls and circuit-breaker trip ranges.
- F. Protect installed heating cables, including non-heating leads, from damage.
- G. Test cables for electrical continuity and insulation integrity before energizing. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.

END OF SECTION 23 05 00

DIVISION 23 - HVAC
SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes hangers and supports for mechanical systems piping and equipment.

1.3 DEFINITIONS

- A. Terminology used in this Section is defined in MSS SP-90.

1.4 PERFORMANCE REQUIREMENTS

- A. Design seismic restraint hangers and supports, for piping and equipment.
- B. Design and obtain approval from authority with jurisdiction over seismic restraint hangers and supports for piping and equipment.

1.5 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract.
- B. Product data for each type of hanger and support.
- C. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- E. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.

1.6 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code--Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."
- C. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.
 - 1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.

- D. Licensed Operators: Use operators that are licensed by powder-operated tool manufacturers to operate their tools and fasteners.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.
 - 1. Components include galvanized coatings or alternate rust preventing shop coating.
 - 2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Thermal-Hanger Shield Inserts: 100-psi average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.
- C. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.
- D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

2.2 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36, steel plates, shapes, and bars, black and galvanized.
- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.
- C. Washers: ASTM F 844, steel, plain, flat washers.
- D. Grout: ASTM C 1107, Grade B, non-shrink, nonmetallic.
 - 1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is non-staining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Water: Potable.
 - 4. Packaging: Premixed and factory-packaged.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger requirements are specified in the Section specifying the equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.2 HANGER AND SUPPORT INSTALLATION

- A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.
- C. Install supports with maximum spacings complying with MSS SP-69.
- D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
- E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.
- F. Install concrete inserts in new construction prior to placing concrete.
- G. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.
- H. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches thick.
- I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- J. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- K. Support all piping direct from structure and independent of other piping.
- L. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- M. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.
- O. Insulated Piping: Comply with the following installation requirements.
 - 1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.
 - 2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.

3. Shields: Install MSS Type 40, protective shields on insulated piping. Shields span an arc of 180 degrees and have dimensions in inches not less than the following:

<u>NPS (Inches)</u>	<u>LENGTH (Inches)</u>	<u>THICKNESS (Inches)</u>
1/4 to 3-1/2	12	0.048
4	12	0.060
5 and 6	18	0.060
8 to 14	24	0.075
16 to 24	24	0.105
4. Pipes 6 Inches and Larger: Include shield inserts.
5. Insert Material: Length at least as long as the protective shield.
6. Thermal-Hanger Shields: Install with insulation of same thickness as piping.

3.3 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without under-cut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.5 PAINTING

- A. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.
- C. Paint all exposed steel surfaces with one coat of primer and two coats of enamel.

END OF SECTION 23 05 29

DIVISION 23 - HVAC
SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:
1. Balancing airflow and water flow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
 2. Adjusting total HVAC systems to provide indicated quantities.
 3. Measuring electrical performance of HVAC equipment.
 4. Setting quantitative performance of HVAC equipment.
 5. Verifying that automatic control devices are functioning properly.
 6. Measuring sound and vibration.
 7. Reporting results of the activities and procedures specified in this Section.
- B. Related Sections include the following:
1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.
 2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.3 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 design quantities.
- C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.
- D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- E. Report Forms: Test data sheets for recording test data in logical order.
- F. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- G. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.
- H. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

- I. Test: A procedure to determine quantitative performance of a system or equipment.
- J. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.
- K. AABC: Associated Air Balance Council.
- L. AMCA: Air Movement and Control Association.
- M. NEBB: National Environmental Balancing Bureau.
- N. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.4 SUBMITTALS

- A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.
- B. Certified Testing, Adjusting, and Balancing Reports: Submit reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.
- C. Sample Report Forms: Submit 3 sets of sample testing, adjusting, and balancing report forms.

1.5 QUALITY ASSURANCE

- A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by AABC.
- B. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by NEBB.
- C. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by either AABC or NEBB.
- D. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and the Design Professional's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days' advance notice of scheduled meeting time and location.
 - 1. Agenda Items: Include at least the following:
 - a. Submittal distribution requirements.
 - b. Contract Documents examination report.
 - c. Testing, adjusting, and balancing plan.
 - d. Work schedule and Project site access requirements.
 - e. Coordination and cooperation of trades and subcontractors.
 - f. Coordination of documentation and communication flow.
- E. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.

2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.
 3. Certify that the Agent has either tested and balanced systems according to the Contract Documents or that systems are balanced to optimum performance capabilities within design and installation limits.
- F. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
- G. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards or in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."
- H. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.
- I. Test and balance process is not deemed as accepted until a complete report is received free of deficiencies and discrepancies and approved in writing by the Engineer.

1.6 PROJECT CONDITIONS

- A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Material Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.7 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.
- B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.
- C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.8 WARRANTY

- A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Furnish one of the following special warranties:
1. National Project Performance Guarantee: Provide a guarantee on AABC'S "National Standards" forms stating that AABC will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents.
 2. Special Guarantee: Provide a guarantee on NEBB forms stating that NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
 - 1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
 - 2. Verify that balancing devices 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 project record documents.
- D. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.
- E. Examine system and equipment test reports.
- F. Examine HVAC system and equipment installations to verify that indicated balancing devices, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- G. Review manufacturer's certification for each piece of HVAC equipment to be tested. Test and balance shall not be performed until certification letters have been obtained.
- H. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- I. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine automatic temperature system components to verify the following:
 - 1. Dampers, valves, and other controlled devices operate by the intended controller.
 - 2. Dampers and valves are in the position indicated by the controller.
 - 3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
 - 4. Automatic modulating and shutoff valves, including 2-way valves and 3-way mixing and diverting valves, are properly connected.
 - 5. Thermostats and sensors are located to avoid adverse effects of sunlight, drafts, and cold walls.
 - 6. Sensors are located to sense only the intended conditions.
 - 7. Sequence of operation for control modes is according to the Contract Documents.
 - 8. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
 - 9. Interlocked systems are operating.
 - 10. Changeover from heating to cooling mode occurs according to design values.

- K. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

- A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
 - 1. Permanent electrical power wiring is complete.
 - 2. Hydronic systems are filled, clean, and free of air.
 - 3. Automatic temperature-control systems are operational.
 - 4. Equipment and duct access doors are securely closed.
 - 5. Balance, smoke, and fire dampers are open.
 - 6. Isolating and balancing valves are open and control valves are operational.
 - 7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 8. Windows and doors can be closed so design conditions for system operations can be met.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

- A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" or AABC National Standards 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 the insulation Specifications for this Project.
- C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- D. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.

- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling unit components.

3.5 CONSTANT-VOLUME AIR SYSTEMS' BALANCING PROCEDURES

- A. The procedures in this Article apply to constant-volume supply-, return-, and exhaust-air systems. Additional procedures are required for variable-air-volume, multizone, dual-duct, induction-unit supply-air systems and process exhaust-air systems. These additional procedures are specified in other articles in this Section.
- B. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer.
 - 1. Measure fan static pressures to determine actual static pressure as follows:
 - a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 2. Measure static pressure across each air-handling unit component.
 - a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
 - 3. Measure static pressures entering and leaving other devices such as duct silencers under final balanced conditions.
 - 4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
 - 5. Adjust fan speed higher or lower than design with the approval of the Design Professional. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
 - 6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.
- C. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.
 - 1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
 - a. Where sufficient space in submains and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 - 2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submains and branch ducts to design airflows within specified tolerances.

- D. Measure terminal outlets and inlets without making adjustments.
 - 1. Measure terminal outlets using standard measurement practices.
- E. Adjust terminal outlets and inlets for each space to design airflows within specified tolerances of design values. Make adjustments using volume dampers rather than extractors and the dampers at the air terminals.
 - 1. Adjust each outlet in the same room or space to within specified tolerances of design quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 - 2. Adjust patterns of adjustable outlets for proper distribution without drafts.
- F. Measure outdoor air flow minimum requirement damper settings as scheduled with controls contractor. Document voltage settings of control damper actuator in the minimum cfm position. For units with CO₂ controls, measure outdoor air flow maximum requirement settings as scheduled with controls contractor. Document voltage setting of control damper actuator in the maximum cfm position. Controls contractor shall provide on-site technical support to modulate outside air damper min/max position with test and balance contractor to accomplish min/max cfm settings for proper unit operation.

3.6 HEAT-TRANSFER COILS

- A. Dx Coils: Measure the following data for each coil:
 - 1. Dry-bulb temperatures of entering and leaving air.
 - 2. Wet-bulb temperatures of entering and leaving air (for cooling coils).
 - 3. Airflow.
 - 4. Air pressure drop.

3.7 TEMPERATURE TESTING

- A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.
- B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of 2 successive 8-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.
- C. Measure outside-air, wet- and dry-bulb temperatures.

3.8 TOLERANCES

- A. Set HVAC system airflow and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans: Plus 5 to plus 10 percent.
 - 2. Air Outlets and Inlets: Minus 10 percent to plus 10 percent.
 - a. In spaces that are to have positive pressure relationship to adjacent spaces, the overall space tolerances for supply airflow shall be 0 to plus 10 percent and return/exhaust airflow shall be 0 to minus 10 percent.
 - b. In spaces that are to have a negative pressure relationship to adjacent spaces, the overall space tolerances for supply airflow shall be 0 to minus 10 percent and return/exhaust airflow shall be 0 to plus 10 percent.

3. Heating-Water Flow Rate: Minus 10 percent to plus 10 percent.
4. Cooling-Water Flow Rate: 0 to plus 10 percent.

3.9 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, 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.

3.10 FINAL REPORT

- A. General: Electronic (PDF) format, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of document signed and sealed by the certified testing and balancing engineer.
 1. Include a list of the instruments used for procedures, along with proof of calibration.
 2. Include letters from HVAC equipment manufacturers certifying that each piece of equipment has been installed and commissioned in accordance with manufacturer's recommendations.
- C. Final Report Contents: In addition to the certified field report data, include the following:
 1. Manufacturers' test data.
 2. Field test reports prepared by system and equipment installers.
 3. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

3.11 ADDITIONAL TESTS

- A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: Perform testing, adjusting, and balancing procedures during near-peak summer (above 85°F) and during near-peak winter conditions (below 40°F.) Retainage may be held until each season has been tested. Refer to contract documents.

END OF SECTION 23 05 93

DIVISION 23 - HVAC
SECTION 23 07 00 – HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes pipe, duct, and equipment insulation.

1.3 DEFINITIONS

- A. Hot Surfaces: Normal operating temperatures of 100 deg F or higher.
- B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.
- C. Cold Surfaces: Normal operating temperatures less than 75 deg F.
- D. Thermal resistivity is designated by an R-value that represents the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivity (R-value) is expressed by the temperature difference in degrees Fahrenheit between the two exposed faces required to cause 1 BTU per hour to flow through 1 square foot at mean temperatures indicated.
- E. Thermal Conductivity (k-value): Measure of heat flow through a material at a given temperature difference; conductivity is expressed in units of Btu x inch/h x sq. ft. x deg F.
- F. Density: Is expressed in lb./cu.ft.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract.
- B. Product data for each type of mechanical insulation identifying k-value, thickness, and accessories. Provide a summary in schedule form of intended insulation material, jacket type, thickness and adhesive type for each pipe, duct or equipment using manufacturer's nomenclature.

1.5 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
 - 1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

1.6 SEQUENCING AND SCHEDULING

- A. Schedule insulation application after testing of piping and duct systems.
- B. Schedule insulation application after installation and testing of heat trace tape.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Glass Fiber:
 - a. CertainTeed Corporation
 - b. Knauf Fiberglass GmbH
 - c. Manville
 - d. Owens-Corning Fiberglas Corporation
 - e. USG Interiors, Inc. - Thermafiber Division
 2. Cellular Glass:
 - a. Pittsburgh Corning Corporation
 - b. Cell-U-Foam Insulation
 - c. Manville
 3. Flexible Elastomeric Cellular:
 - a. Armaflex; Armacell LLC
 - b. K-Flex; Nomaco K-Flex Corporation
 - c. Aerocel; Aeroflex USA, Inc.

2.2 GLASS FIBER

- A. Material: Inorganic glass fibers, bonded with a thermosetting resin.
- B. Jacket: All-purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.
- C. Board: ASTM C 612, Class 2, semi-rigid jacketed board.
1. Thermal Conductivity: 0.26 Btu x inch/h x sq. ft. x deg F average maximum, at 75 deg F mean temperature.
 2. Density: 3 pcf minimum.
- D. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets.
1. Thermal Conductivity: 0.32 Btu x inch/h x sq. ft. x deg F average maximum, at 75 deg F mean temperature.
 2. Density: 3/4 pcf minimum within building envelope.
 3. Density: 1 pcf minimum exterior to building envelope.
- E. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.
1. Thermal Conductivity: 0.26 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F mean temperature.
 2. Density: 3 pcf minimum.
- F. Adhesive: Produced under the UL Classification and Follow-up service.
1. Type: Non-flammable - solvent-based.
 2. Service Temperature Range: Minus 20 to 180 deg F.

- G. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.3 CELLULAR GLASS

- A. Material: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.
- B. Facing: ASTM C 921, Type 1, factory-applied, laminated foil, flame-retardant, vinyl facing.
- C. Form: The following as indicated:
 - 1. Blocks: ASTM C 552, Type I.
 - 2. Boards: ASTM C 552, Type IV.
 - 3. Preformed Pipe: ASTM C 552, Type II, Class 2 (jacketed).
 - 4. Special Shapes: ASTM C 552, Type III, in shapes and thicknesses as indicated.
- D. Thermal Conductivity: 0.38 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F mean temperature.
- E. Minimum Density: 7 pcf.
- F. Maximum Density: 9.5 pcf.

2.4 FLEXIBLE ELASTOMERIC CELLULAR

- A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.
 - 1. Tubular Materials: ASTM C 534, Type I.
 - 2. Sheet Materials: ASTM C 534, Type II.
- B. Thermal Conductivity: 0.25 Btu x inch/h x sq. ft. x deg F average maximum at 75 deg F.
- C. Coating: Water based latex enamel coating recommended by insulation manufacturer.
- D. Fire Performance Characteristics: Provide material having the following fire performance characteristics as determined by UL in accordance with ASTM Standard E84:
 - 1. Flame Spread = 25
 - 2. Smoke Developed = 50

2.5 ADHESIVES

- A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.
- B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:
 - 1. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.
 - 2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.6 SEALING COMPOUNDS

- A. Vapor Barrier Compound: Water-based, fire-resistive composition.

1. Water Vapor Permeance: 0.15 perm maximum.
 2. Temperature Range: Minus 20 to 180 deg F.
- B. Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.
1. Water Vapor Permeance: 0.02 perm maximum.
 2. Temperature Range: Minus 50 to 250 deg F.
 3. Color: Aluminum.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

3.2 INSTALLATION, GENERAL

- A. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.
- B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
- C. Install vapor barriers on insulated pipes, ducts, and equipment having surface operating temperatures below 60 deg F.
- D. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- E. Install insulation with smooth, straight, and even surfaces.
- F. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.
- G. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.
- H. Seal Ends: Except for flexible elastomeric insulation, taper ends at 45-degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.
- I. Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.
- J. Keep insulation materials dry during application and finishing.
- K. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:
1. Fibrous glass ducts.
 2. Factory-insulated flexible ducts.
 3. Factory-insulated plenums, casings, terminal boxes and filter boxes and sections.
 4. Flexible connectors for ducts and pipes.
 5. Vibration control devices.
 6. Testing laboratory labels and stamps.
 7. Nameplates and data plates.
 8. Pre-insulated access panels and doors in air distribution systems.

9. Sanitary drainage and vent piping. (Drainage piping receiving air conditioning condensate shall be insulated.)
10. Below grade piping.

3.3 DUCT INSULATION

- A. Install block and board insulation as follows:
 1. Adhesive and Band Attachment: Secure block and board insulation tight and smooth with at least 50-percent coverage of adhesive. Install bands spaced 12-inches apart. Protect insulation under bands and at exterior corners with metal corner angles. Fill joints, seams, and chipped edges with vapor barrier compound.
 2. Speed Washers Attachment: Secure insulation tight and smooth with speed washers and welded pins. Space anchor pins 18-inches apart each way and 3-inches from insulation joints. Apply vapor barrier coating compound to insulation in contact, open joints, breaks, punctures, and voids in insulation.
- B. Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:
 1. Smaller Than 24-Inches: Bonding adhesive applied in 6 inches wide transverse strips on 12-inches centers.
 2. 24-Inches and Larger: Anchor pins spaced 12 inches apart each way. Apply bonding adhesive to prevent sagging of the insulation.
 3. Overlap joints 3 inches.
 4. Seal joints, breaks, and punctures with vapor barrier compound and glass tape (glasfab and mastic).

3.4 JACKETS

- A. Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2 inches laps at longitudinal joints and 3-inch-wide butt strips at end joints.
 1. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound (mastic) and glass tape (glassfab).
- B. Interior Exposed Insulation: Install continuous stainless-steel jackets.
- C. Interior Exposed Insulation: Install continuous aluminum jackets.
- D. Interior Exposed Insulation: Install continuous PVC jackets.
- E. Interior Exposed Insulation: Install continuous glass cloth jackets.
- F. Exterior Exposed Insulation: Install continuous aluminum jackets and seal all joints and seams with waterproof sealant.
- G. Exterior Exposed Insulation: Install continuous stainless-steel jackets and seal all joints and seams with waterproof sealant.
- H. Exterior Exposed Insulation: Install continuous PVC jackets and seal all joints and seams with waterproof sealant.

- I. Install metal jacket with 2 inches overlap at longitudinal and butt joints. Overlap longitudinal joints to shed water. Seal butt joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel draw bands 12 inches on center and at butt joints.
- J. Install the PVC jacket with 1-inch overlap at longitudinal and butt joints and seal with adhesive.
- K. Install glass cloth jacket directly over insulation. On insulation with a factory applied jacket, install the glass cloth jacket over the factory applied jacket. Install jacket drawn smooth and tight with a 2-inch overlap at joints. Embed glass cloth between (2) 1/16inch thick coats of lagging adhesive. Completely encapsulate the insulation with the jacket, leaving no exposed raw insulation.

3.5 FINISHES

- A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed exterior insulation.

3.6 APPLICATIONS

- A. General: Materials and thicknesses are specified in schedules at the end of this Section.
- B. Duct Systems: Unless otherwise indicated, insulate the following duct systems:
 - 1. Supply, return and outside air ductwork. (Except double-wall spiral duct exposed in occupied building spaces.)
 - 2. Above-ceiling surfaces of all air devices except where pre-insulated.
 - 3. Interior exposed supply, return and outside air ductwork.
 - 4. Interior exposed and concealed supply fans, air handling unit casings and outside air plenums.
 - 5. Interior exposed range hood exhaust ductwork.
 - 6. Interior concealed range hood exhaust ductwork.
 - 7. Interior exposed oven and dishwasher exhaust ductwork.
 - 8. Interior concealed oven and dishwasher ductwork.

3.7 DUCTWORK AND PLENUM INSULATION SCHEDULES

- A. General: Furnish vapor barrier on all ductwork insulation.
- B. Schedules:
 - 1. Supply, return, and outdoor air ductwork:
 - a. Lined and unlined within building insulation envelope: 2" glass fiber blanket. Seal all joints and penetrations in jacket with glasfab and mastic.
 - b. Outside Building Insulation Envelope: 3" glass fiber blanket or board.
 - 2. Exterior Supply and return, relief ductwork between air inlet devices and HVAC units and outdoor air ductwork (lined and unlined): 2" polyisocyanurate board with aluminum jacket.
 - 3. Supply, Return and Outdoor Air Ductwork (lined and unlined) Exposed in Mechanical Rooms: 2" glass fiber board.

END OF SECTION 23 07 00

DIVISION 23 - HVAC
SECTION 23 09 00 - CONTROLS SYSTEM EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes control equipment for HVAC systems and components.
- B. Related Section: Division 23 Section "Sequence of Operation" contains requirements that relate to this Section.

1.3 SYSTEM DESCRIPTION

- A. Control system consists of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and direct digital controllers (DDC) operating in a high-speed, peer-to-peer network hosted by a Facility Management System (FMS) server running a webserver software application. System shall be programmed to operate mechanical systems according to sequences of operation indicated or specified.
- B. System software shall be based on a server/thin-client architecture, designed around the open standards of web technology. The FMS system server shall be accessed using Web browsers over the control system network, the Owner's local area network (LAN), and over the Internet (at the Owner's discretion). Current web browsers shall be capable of accessing the web server including Google Chrome, Mozilla Firefox, Apple Safari and Microsoft Edge. Contractor shall be responsible for coordination with the Owner's IT staff to ensure that the FMS will perform in the Owner's environment without disruption to any of the other activities taking place on the LAN.
- C. The intent of the thin-client architecture is to provide operators complete access to the control system via a Web browser. No additional software or applications shall be required to access graphics and point displays or configure trends, points and controllers. Computer and Mobile Device browsers shall be supported.
- D. FMS contractor shall provide all control panels, power supplies, wiring, conduit, solenoid valves, relays, differential pressure transmitters, differential pressure switches, pressure sensors, interface devices, etc. necessary for a complete and operable automatic control system and for communication through the Owner's LAN.
- E. System shall use the BACnet protocol for communication to the FMS web server and for communication between control modules. I/O points, schedules, setpoints, trends, and alarms specified or on the drawings or identified in the "Sequence of Operation" shall be BACnet objects.
- F. All new digital controls shall interface with the existing FMS server for this building/facility. Integrate new graphics pages into existing web interface in an intuitive manner. A hyperlink to another system software is not acceptable.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract.

- B. Product Data for each type of product specified. Include manufacturer's technical Product Data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, installation instructions, and startup instructions.
- C. Where equipment, controllers or sensors furnished as a part of other mechanical equipment are to be interlocked or interfaced with the control system (FMS) furnished under this section, provide documentation from the equipment manufacturer or supplier indicating all wiring and software requirements have been coordinated and accommodated. Provide references in the FMS diagrams and operational sequences indicating these accommodations. Where equipment controllers are integrated into the FMS via BACnet Protocol, provide the Protocol Implementation Conformance Statement (PICS) for each controller type and indicate which points being incorporated into the FMS are readable or writable, inputs or outputs, and analog or digital.
- D. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection. Submit damper leakage and flow characteristics, plus size schedule for controlled dampers.
- E. Shop Drawings containing the following information for each control system:
 - 1. Schematic flow diagram showing fans, pumps, coils, dampers, valves.
 - 2. Each control device labeled with setting or adjustable range of control.
 - 3. Diagrams for all required electrical wiring. Clearly differentiate between factory-installed and field-installed wiring.
 - 4. Details of control panel faces, including controls, instruments, and labeling.
 - 5. Written description of sequence of operation.
 - 6. Trunk cable schematic showing programmable control unit locations and trunk data conductors.
 - 7. Listing of connected data points, including connected control unit and input device.
 - 8. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
 - 9. System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
 - 10. Software description and sequence of operation.
- F. Wiring diagrams detailing wiring for power, signal, and control systems and differentiating clearly between manufacturer-installed and field-installed wiring. Furnish wiring diagrams and coordination documentation for all controlled equipment furnished by other suppliers under Division 23.
- G. Maintenance data for control systems equipment to include in the operation and maintenance manual. Include the following:
 - 1. Maintenance instructions and spare parts lists for each type of control device.
 - 2. Interconnection wiring diagrams with identified and numbered system components and devices.
 - 3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
 - 4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
 - 5. Calibration records and list of set points.
 - 6. Manufacturer's literature for flow measurement systems.
- H. Field Test Reports: Procedure and certification of pneumatic control piping system.
- I. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer specializing in control system installations.
- B. Manufacturer Qualifications: Engage a firm experienced in manufacturing control systems similar to those indicated for this Project and that have a record of successful in-service performance.
- C. Startup Personnel Qualifications: Engage specially trained personnel in direct employ of manufacturer of primary temperature control system.
- D. Comply with NFPA 90A.
- E. Comply with NFPA 70.
- F. Coordinate equipment selection with Division 26 Section covering Fire Alarm Systems to achieve compatibility with equipment that interfaces with that system.
- G. For web-based control systems, furnish additional password and access license (if required) to the Engineer for a period not less than 1-year from control system start-up.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store equipment and materials inside and protected from weather.
- B. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping control devices to unit manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Direct Digital Control (DDC) Systems and Components:
 - a. Automated Logic Corp. (ALC)

2.2 DIRECT DIGITAL CONTROL (DDC) EQUIPMENT

- A. Overall Conceptual Description
 - 1. The FMS shall be designed entirely for use on intranets and internets. All networking technology shall be off the shelf, industry standard technology fully compatible with other owner provided networks in the facility.
 - 2. All aspects of the user interface shall be accessed via standard web browsers (Chrome, Firefox, or Microsoft Edge). Access shall be via the internet or the Owner's LAN.
 - 3. The user interface shall be complete as described herein, providing complete tool sets, operational features, multi- panel displays, and other display features.
- B. General:
 - 1. The FMS shall consist of a number of controllers and associated equipment connected by industry standard network practices. All communication between Controllers shall be by digital means only.

2. The FMS network shall at minimum comprise of the following:
 - a. Network processing, data storage and communication equipment including file servers (provided under this contract).
 - b. Routers, bridges, switches, hubs, modems and like communications equipment.
 - c. Active processing Controllers included in field panels.
 - d. Intelligent and addressable elements and end devices.
 - e. Third-party equipment interfaces.
 - f. Other components required for a complete and working FMS.
 3. The servers and principal network equipment shall be standard products of recognized major manufacturers available through normal PC vendor channels.
 4. Provide licenses for all software residing in the FMS system and transfer these licenses to the Owner prior to completion.
- C. Network:
1. The FMS Network shall utilize an open architecture capable of all of the following:
 - a. Utilizing standard Ethernet communications and operate at a minimum speed of 10/100 Mb/sec.
 - b. Connecting via BACnet to any controller or controlled device in accordance with ANSI/ASHRAE Standard 135.
 2. The FMS network shall support both copper and optical fiber communication media.
- D. Controllers:
1. General: Provide an adequate number of Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC) as required to achieve performance specified. Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L.
 2. Building Controllers (BCs): Each shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
 - a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
 - b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
 3. Advanced Application Controllers (AACs): Each AAC shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.
 - a. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
 4. Application Specific Controllers (ASCs): Each ASC shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.
 - a. Each ASC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, using the ARCNET or MS/TP Data Link/Physical layer protocol.

- b. Each ASC shall operate as a standalone controller capable of performing its specified control responsibilities independently of other controllers in the network.
 - c. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.
- E. Downloading and Uploading:
- 1. Provide the capability to generate FMS software-based sequences, database items and associated operational definition information and user-required revisions to same at any Browser, and the means to download same to the associated controller.
 - 2. Application software tool used for the generation of custom logic sequences shall be resident in both the application controller and the server(s) where indicated on the drawings.
 - 3. Provide the capability to upload FMS operating software information, database items, sequences and alarms to the designated server(s).
 - 4. The functions of this Part shall be governed by the codes, approvals and regulations applying to each individual FMS application.

2.3 WEB INTERFACE

A. General:

- 1. The FMS user interface shall be user friendly, readily understood and shall make maximum use of colors, graphics (including floor plan graphics), icons, embedded images, animation, text-based information and data visualization techniques to enhance and simplify the use and understanding of the FMS by authorized users.
- 2. User access to the FMS shall be protected by a flexible and Owner re-definable software-based password access protection. Each username shall be individually configurable with capabilities and restrictions relating to abilities (read or write) and specific building areas (wings, floors, entire building, etc.). It shall be possible to designate read ability in one area of the building with write ability in another area for each specific user.

B. Fault Detection and Diagnostics:

- 1. The system shall automatically monitor the operation of all building management panels and controllers. The failure of any device shall be annunciated to the Operator.
- 2. Alarm Processing: System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as specified in Sequences of Operation. Alarms shall be BACnet alarm objects and shall use BACnet alarm services.
- 3. Alarm Messages: Alarm messages shall use the English language descriptor for the object in alarm in such a way that the operator will be able to recognize the source, location, and nature of the alarm without relying on acronyms or mnemonics.
- 4. Alarm Reactions: Operator shall be able to configure (by object) what, if any actions are to be taken during an alarm. As a minimum, the workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate.
- 5. Alarm and Event log: Operators shall be able to view all system alarms and changes of state from any location in the system. Events shall be listed chronologically. An operator with the proper security level may acknowledge and delete alarms and archive closed alarms to the workstation or web server hard disk. Provide an audit trail by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.
- 6. In addition to the BACnet alarm services and diagnostics, the FMS shall annunciate application alarms as required by Part 3 herein, the Sequence of Operation, and the Drawings where indicated.

7. The Owner shall have the ability to add or delete any alarm sequences and shall have the ability to route specific alarms from specific points to specific defined usernames.
- C. Historical trending and data collection:
1. Trend and store point history data for all FMS points and values as selected by the user.
 2. Provide sufficient server space to file all available points within the system for a period of fourteen (14) days in fifteen (15) minute intervals.
 3. The trend data shall be stored in a manner that allows custom queries and reports using industry-standard software tools. The data shall also be configurable within the web interface to display trends in a graphic manner utilizing colors, editable data ranges, durations, legends, and axis descriptions.
 4. At a minimum, provide the capability to perform statistical functions on the historical database:
 - a. Average.
 - b. Arithmetic mean.
 - c. Maximum/minimum values.
 - d. Range difference between minimum and maximum values.
 - e. Standard deviation.
 - f. Sum of all values.
 - g. Variance.
- D. FMS Shop Drawing Graphics: Provide links within the Web Interface to corresponding controller (BC, AAC, and ASC) wiring diagrams pages from the final approved shop drawings.

2.4 CONTROL PANELS

- A. Control Panels: Unitized cabinet with suitable brackets for wall or floor mounting, located adjacent to each system under automatic control. Provide common keying for all panels.
1. Fabricated panels of 0.06-inch-thick, furniture-quality steel, or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock, with manufacturer's standard shop-painted finish and color.
 2. Panel-Mounted Equipment: Temperature and humidity controllers, relays, and automatic switch; except safety devices. Mount devices with adjustments accessible through front of panel.
 3. Door-Mounted Equipment: Flush-mount (on hinged door) manual switches, including damper-positioning switches, changeover switches, thermometers, and gages.
 4. Controller Diagrams: Provide a diagram inside the control panel indicating which wires landed on each controller correspond to which sensors, actuators, outputs, etc. consistent with corresponding pages within the final approved shop drawings. All hardcopy documents shall be laminated, legible, and permanently affixed inside the panel.
 5. Controller Legend: Where controllers have a display screen displaying abbreviated names for sensors, actuators, setpoints, outputs, etc., provide a legend inside the control panel indicating the abbreviated and full name of each item.
- B. Fire Fighters Smoke-Control Station (FSCS): Furnish UL-Listed panel for fire department emergency purposes only. Panel shall include manual-control or override of automatic control for mechanical smoke control systems. Locate panel adjacent to the fire alarm control panel or other approved location by the authority having jurisdiction.
1. Furnish status indication, fault condition indication and manual control of all smoke control system components per the International Fire code 2006 paragraph 909.16 and NFPA 92A.
 2. "On" status shall be sensed by a pressure difference, an airflow switch or some other positive proof of airflow.

3. Furnish "Lampstest" momentary push button for testing the pilot lamps.
4. Furnish diagram and graphic representation of the smoke control system.
5. The FSCS shall have the highest priority control over all smoke control systems and equipment.
6. The FSCS fan control capability shall not be required to bypass hand-off-auto or start/stop switches located on motor controllers of non-dedicated smoke control system fans.
7. FSCS control shall not take precedence over fire suppression, electrical protection or personnel protection devices.

2.5 SENSORS

- A. Electronic Sensors: Vibration and corrosion resistant, for wall, immersion, or duct mounting as required.
 1. Resistance Temperature Detectors or Thermistors:
 - a. Accuracy: Plus-or-minus 1°F at calibration point.
 - b. Wire: Twisted, shielded-pair cable.
 - c. Insertion Elements in Ducts: Use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.
 - d. Averaging Elements in Ducts: Use where ducts are larger than 9 sq. ft. or where prone to stratification, length as required.
 - e. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.
 - f. Room Sensors: Match room thermostats, locking cover.
 - g. Outside Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
 - h. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.
 2. Humidity Sensors: Bulk polymer sensor element.
 - a. Accuracy: 5 percent full range with linear output.
 - b. Room Sensors: With locking cover matching room thermostats, span of 25 to 90 percent relative humidity.
 - c. Duct and Outside Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.
 3. Static-Pressure or Differential Pressure Transmitter: Non-directional sensor with suitable range for expected input, temperature compensated.
 - a. Accuracy: 2-percent of full scale with repeatability of 0.5 percent.
 - b. Output: 4 to 20 mA or 0 - 10 VDC.
 - c. Building Static-Pressure Range: 0 to 0.25 inch wg.
 - d. Duct Static-Pressure Range: 0 to 5 inches wg.
 4. Differential Pressure Transducer (Velocity Pressure) for airflow measured applications:
 - a. Accuracy: 0.1% or better, of full scale.
 - b. Operating temperature limits: 32 - 122EF.
 - c. Outputs: 0-10 VDC or 4-20 mA.
 - d. Auto-Zero and temperature compensation capability.
 5. Pressure Transmitters: Direct acting for gas, liquid, or steam service, range suitable for system, proportional output 4 to 20 mA or 0 - 10 VDC.

- B. Equipment Operation Sensors: As follows:
 - 1. Status Inputs for Fans: Differential-pressure switch with adjustable range of 0 to 5 inches wg.
 - 2. Status Inputs for Electric Motors: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

2.6 ROOM THERMOSTATS

- A. Direct Digital Control (DDC) Thermostat: Thermostats shall consist of room temperature sensors with setpoint adjustment means in a wall-mounted enclosure. Furnish with the following:
 - 1. Override button.
 - 2. Humidity sensing (where indicated on the Drawings).
 - 3. CO² sensing (where indicated on the Drawings).
 - 4. Sliding scale adjustment.
- B. Room Thermostat Accessories: As follows:
 - 1. Insulating Bases: For thermostats located on exterior walls.

2.7 DAMPERS

- A. Dampers: AMCA-rated, parallel or opposed blade design; form frames from not less than 0.1084-inch galvanized steel with mounting holes for duct mounting; damper blades not less than 0.0635-inch galvanized steel, with maximum blade width of 8 inches.
 - 1. Blades secured to 1/2-inch diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass. Ends sealed against spring-stainless-steel blade bearings. Thrust bearings at each end of every blade.
 - 2. Operating Temperature Range: From -40 to 200 deg F.
 - 3. For standard applications as indicated, (as selected by manufacturer's sizing techniques) with optional closed-cell neoprene edging.
 - 4. For low-leakage applications (outdoor air) as indicated, provide parallel or opposed blade design (as selected by manufacturer's sizing techniques) with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm/sq. ft. of damper area, at differential pressure of 4 inches wg when damper is being held by torque of 50 inch-pounds; test in accordance with AMCA 500.

2.8 RELAYS

- A. Control relays shall be UL listed plug-in type with dust cover. Contact rating, configuration and coil voltage suitable for application.
- B. Time delay relays shall be UL listed solid state plug-in type with adjustable time delay. Delay shall be adjustable plus or minus 200% (minimum) from set-point shown on plans. Contact rating, configuration and coil voltage suitable for application. Provide NEMA 1 Type enclosure when not installed in local control panel.

2.9 TRANSFORMERS AND POWER SUPPLIES

- A. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.

- B. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.
- C. Unit shall operate between 0 c and 50 c.
- D. Unit shall be UL recognized.

2.10 SMOKE DETECTORS

- A. Smoke detectors shall be located in the duct upstream of each smoke or combination fire/smoke damper. Detectors shall also be located on the wall adjacent to each smoke or combination fire/smoke damper located in plenum smoke partition.
- B. In systems of over 2,000 cfm capacity smoke detectors approved for duct installation shall be installed at a suitable location in:
 - 1. The main supply duct downstream of the unit filter and supply fan.
- C. Smoke detectors and duct housings shall be provided under Division 26. Detectors shall be compatible with existing fire alarm system and shall be approved by the Owner.
- D. Detectors and duct housings used to activate smoke dampers and shut down air handlers shall be mounted under Division 23. Detectors shall be mounted in accordance with NFPA 72.
 - 1. Sampling tubes shall extend full width of duct.
 - 2. Provide access door at smoke detector.
 - 3. Test/reset switches for smoke detectors are furnished and installed under Division 26.

2.11 SMOKE DAMPERS AND COMBINATION SMOKE AND FIRE DAMPERS

- A. Smoke dampers and combination smoke and fire dampers will be provided under Division 23. Control of dampers shall be under this section (HVAC Controls):
 - 1. A status panel for smoke dampers shall be provided in the ceiling below the individual dampers. Panel shall contain a red neon pilot light that shall be illuminated when damper is closed.
 - a. Provide damper position interlock to ensure that smoke dampers are open 100% before air handling unit fan is started.

2.12 CONTROL CABLE

- A. Electronic Cable for Control Wiring: Refer to Division 26 Sections.
- B. Optical-Fiber Cable for Control Wiring: Refer to Division 26 Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field end devices and wiring are installed before proceeding with installation.

3.2 INSTALLATION

- A. Install equipment as indicated to comply with manufacturer's written instructions.
- B. Install software in control units and FMS server. Implement all features of programs to specified requirements and appropriate to sequence of operation.
- C. Connect and configure equipment and software to achieve the sequence of operation specified.
- D. Verify location of thermostats and other exposed control sensors with plans and room details before installation.
 - 1. Install wall-mounted thermostats 4'-6" A.F., unless indicated otherwise. Coordinate mounting height with Architect.
 - 2. Install wall-mounted thermostats minimum 8" away from door or window frames. Coordinate location with switches and other devices provided under other Divisions.
- E. Install damper motors on outside of duct in warm areas, not where exposed to outdoor temperatures.
- F. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
- G. Install labels and nameplates to identify control components according to Division 23 Sections specifying mechanical identification.
- H. Install optical-fiber cable according to Division 26 Sections.

3.3 ELECTRICAL WIRING AND CONNECTIONS

- A. Install raceways, boxes, and cabinets according to Division 26.
- B. Install building wire and cable according to Division 26.
- C. Install signal and communication cable according to Division 26.
 - 1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
 - 2. Except as indicated below, route all wiring in plenum rated cable secured to the structure.
 - 3. All wiring associated with smoke detectors, smoke dampers, fire alarm shutdowns and similar systems shall be routed in conduit.
 - 4. Bundle and harness multi-conductor instrument cable in place of single cables where a number of cables follow a common path.
 - 5. Fasten flexible conductors, bridging cabinets and doors, neatly along hinge side; protect against abrasion. Tie and support conductors neatly.
 - 6. Number-code or color-code conductors, except local individual room controls, for future identification and servicing of control system.
- D. Connect electrical components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.
- E. Connect manual reset limit controls independent of manual control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

- F. Connect HAND-OFF-AUTO selector switches to override automatic interlock controls when switch is in HAND position.
- G. Make electrical connections to power supply and electrically operated meters and devices.
- H. Where not indicated otherwise, obtain power for control units from the nearest un-switched receptacle circuit.

3.4 COMMISSIONING

- A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to start control systems.
- B. Test and adjust controls and safeties.
- C. Replace damaged or malfunctioning controls and equipment.
- D. Start, test, and adjust control systems.
- E. Demonstrate compliance with requirements.
- F. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

3.5 DEMONSTRATION

- A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to demonstrate and train Owner's maintenance personnel as specified below.
 - 1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
 - 2. Schedule training with Owner with at least 7 days' notice.
 - 3. Provide operator training on data display, alarm and status descriptors, requesting data, execution of commands, and request of logs. Include a minimum of (1) hour dedicated instructor time on-site.

END OF SECTION 23 09 00

DIVISION 23 - HVAC
SECTION 23 09 93 - SEQUENCE OF OPERATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes control sequences for HVAC systems and terminal units.
- B. The Facility Management System (FMS) input/output summary is listed on the Drawings. Furnish listed points plus others required to achieve sequence of operation.
- C. Where equipment is to operate using manufacturer supplied unit-mounted controls, integrate controls into the FMS utilizing a BacNet interface. Provide all necessary hardware and programming.

1.3 SAFETY AND RELIABILITY SYSTEMS

- A. Smoke Detector/Air Handling Unit:
 - 1. In systems with air handling capacity above 2,000 CFM and up to and including 15,000 CFM, the smoke detector mounted in the unit or main ductwork shall, when sensing smoke, shut down the Air Handling Unit. The smoke detectors shall be connected to the fire alarm system. The actuation of smoke detector shall activate a visible and supervisory signal at a constantly attended location. Where an outdoor condensing unit or heat pump is used it shall shut down those components.
 - 2. Air-handling units shall deenergize on any general building fire alarm activation.
 - 3. Integrate new air-handling equipment into the facility's existing fire alarm shutdown sequence.
 - 4. An emergency air handling system shutdown switch shall be located adjacent to the main fire alarm panel. All air handling units shall de-energize whenever the master shutdown switch located at the main fire alarm panel is activated.
- B. Smoke (or Combination) Damper/Smoke Detector: Upon sensing smoke at the detector, the damper shall close. When the damper is closed, the indicator light shall illuminate on the ceiling below the damper.
- C. Upon any fan system (i.e. air handling unit, exhaust fan) shutdown, all smoke dampers (or combination smoke/fire dampers) in that fan system's duct system shall close. Coordinate damper closure sequence/fan system shutdown with fire alarm system contractor. Fan restart shall require damper end switch proof of opening in order to reenergize fan(s).
- D. Auto Restart: All HVAC systems and equipment shall be configured such that normal operation is resumed after a power failure.
- E. Dead Band: Where used to control both heating and cooling, zone thermostats shall be capable of providing a temperature dead band of at least 5°F in accordance with ASHRAE standard 90.1.
- F. Setback/Overrides:
 - 1. All HVAC systems/units shall be scheduled for operation by the DDC system. The occupancy schedule shall be prescribed by the Owner.

2. In unoccupied mode, the temperature setpoint shall be set back to 50°F for heating and 85°F for cooling. Unit supply fans shall run only as required to maintain setback temperatures. The ERU's shall not operate, outdoor air dampers shall be closed, and exhaust fans shall not operate.
3. Prior to the occupancy period, the HVAC systems shall energize to cool or warm the spaces to normal occupied setpoint. ERU's shall not energize, outdoor air dampers shall remain closed, and exhaust fans shall remain off during warmup/cool-down.
4. ERU's shall only operate, outdoor air dampers shall open to setpoint, and general exhaust fans shall energize only when setpoint is reached and the building is in occupied mode.
5. Individual HVAC systems shall be equipped with override buttons on the unit thermostats. When the button is activated, the unit shall operate in occupied mode for a period determined by the Owner.

G. Chemical Emergency Shutdown:

1. When the switch is actuated, all HVAC systems throughout the building shall shut down and outdoor air dampers close. Affected systems include all heating/cooling units, makeup air systems and exhaust air systems.
2. The facility management control system shall also be able to initiate the actions described above remotely.

1.4 UNITARY SYSTEMS

A. Packaged Rooftop Units with single zone control (electric cool/gas heat):

1. When scheduled to run by the FMS, the unit shall energize and run.
2. Outdoor and return air dampers shall modulate to maintain minimum outdoor airflow. During unoccupied mode, outside air damper shall be closed.
3. Unit shall energize heating or cooling stages in response to the room thermostat.
4. Unit shall operate in economizer mode whenever the return air enthalpy exceeds the outdoor air enthalpy. When unit is in economizer mode, the relief fan shall energize to relieve building pressure.
5. During times when the unit is off or in warmup mode, the outdoor air damper shall be closed.
6. Unit shall energize in heating mode when it is not scheduled to run, but the zone temperature falls below 50°F.
7. For units equipped with hot gas reheat dehumidification coils, room humidity sensors shall be located in the main return duct adjacent to the unit or unit plenum.
 - a. When the space humidity exceeds 60% Rh (adjustable), the unit shall operate in dehumidification mode. Unit shall energize all cooling stages to reach dehumidification setpoint.
 - b. When in dehumidification mode, if the space temperature falls below the temperature setpoint, the hot gas reheat valve shall send gas to the reheat coil.

B. Heat Pump Units:

1. Units shall be controlled by room thermostats.
2. Runtime of the unit shall be scheduled by the FMS. During unoccupied mode, outside air damper shall be closed (where applicable.)
3. When unit is scheduled to run, the compressor, heat/cool reversing valve and supply fan shall energize in heating or cooling mode as required to satisfy the thermostat setpoint.
4. When the compressor is unable to meet the heating requirements, the auxiliary strip heat shall energize.

5. When outdoor air temperature is above 45°F (adj), resistance heat shall not be energized.
6. When equipped with hot gas reheat, unit shall operate in full cooling mode when room humidity setpoint is exceeded. Hot gas valve shall open to the coil as required to prevent overcooling.

1.5 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract.
- B. Shop Drawings showing operating sequences of various equipment, devices, components, and materials included in the Text and defining the components' contribution to the system.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 23 09 93

DIVISION 23 - HVAC
SECTION 23 31 13 - METAL DUCTWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract apply to this Section.
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Division 23 Section "Duct Accessories" for flexible duct materials, dampers, duct-mounted access panels and doors, turning vanes, duct silencers, fabric ducts, pre-insulated outdoor ductwork and turning vanes.
 - 2. Division 23 Section "HVAC Insulation" for external duct and plenum insulation.
 - 3. Division 23 Section "HVAC Casings" for factory- and field-fabricated casings for mechanical equipment.
 - 4. Division 23 Section "Diffusers, Registers, Grilles and Louvers."
 - 5. Division 23 Section "Air Terminals," for constant-volume control boxes, variable-air-volume control boxes, and reheat boxes.
 - 6. Division 23 Section "Control Systems Equipment" for automatic volume control dampers and operators.
 - 7. Division 23 Section "Testing, Adjusting, and Balancing."

1.2 SUMMARY

- A. This Section includes rectangular and round metal ducts and plenums for heating, ventilating, and air conditioning systems in pressure classes from minus 4 inches to plus 10 inches water gage.

1.3 DEFINITIONS

- A. Sealing Requirements Definitions: For the purposes of duct systems sealing requirements specified in this Section, the following definitions apply:
 - 1. Seams: A seam is defined as joining of two longitudinally (in the direction of airflow) oriented edges of duct surface material occurring between two joints. All other duct surface connections made on the perimeter are deemed to be joints.
 - 2. Joints: Joints include girth joints; branch and subbranch intersections; so-called duct collar tap-ins; fitting subsections; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum, and casing abutments to building structures.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

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

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract.
- B. Product data including details of construction relative to materials, dimensions of individual components, profiles, and finishes for the following items:

1. Duct Liner.
 2. Sealing Materials.
- C. Coordination drawings for ductwork installation in accordance with Division 23 Sections. In addition to the requirements specified, show the following:
1. Coordination with ceiling suspension members.
 2. Spatial coordination with other systems installed in the same space with the duct systems.
 3. Coordination of ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.
 4. Coordination with ceiling-mounted lighting fixtures and air outlets and inlets.
- D. Welding certificates including welding procedures specifications, welding procedures qualifications test records, and welders' qualifications test records complying with requirements specified in "Quality Assurance" below.
- E. Record drawings including duct systems routing, fittings details, reinforcing, support, and installed accessories and devices.
- F. Maintenance data for volume control devices, fire dampers, and smoke dampers.

1.6 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel" for hangers and supports and AWS D9.1 "Sheet Metal Welding Code."
- B. Qualify each welder in accordance with AWS qualification tests for welding processes involved. Certify that their qualification is current.
- C. NFPA Compliance: Comply with the following NFPA Standards:
 1. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," except as indicated otherwise.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sealant and fire-stopping materials to site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle sealant materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.
- C. Deliver and store stainless steel sheets with mill-applied adhesive protective paper, maintained through fabrication and installation.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- A. Sheet Metal, General: Provide sheet metal in thicknesses indicated, packaged and marked as specified in ASTM A 700.

- B. Galvanized Sheet Steel: Lock-forming quality, ASTM A 527, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.
- C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 SEALING MATERIALS

- A. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for class 1 ducts.
- B. Joint and Seam Sealant: One-part, non-sag, solvent-release-curing, polymerized butyl sealant complying with FS TT-S-001657, Type I; formulated with a minimum of 75 percent solids.
- C. Flanged Joint Mastics: One-part, acid-curing, silicone elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.3 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials. Do not use powder actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.
- B. Hangers: Galvanized sheet steel, or round, zinc plated steel, threaded rod.
 - 1. Hangers Installed in Corrosive Atmospheres: Electro-galvanized, all-thread rod or hot-dipped-galvanized rods with threads painted after installation.
 - 2. Straps and Rod Sizes: Conform with Table 4-1 in SMACNA HVAC Duct Construction Standards, 1995 Edition, for sheet steel width and gage and steel rod diameters.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes conforming to ASTM A 36.
 - 1. Where galvanized steel ducts are installed, provide hot-dipped-galvanized steel shapes and plates.
 - 2. For stainless steel ducts, provide stainless steel support materials.
 - 3. For aluminum ducts, provide aluminum support materials, except where materials are electrolytically separated from ductwork.

2.4 RECTANGULAR DUCT FABRICATION

- A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards," Tables 1-3 through 1-19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.
 - 1. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
 - 2. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
 - 3. Square throat, round heel elbows shall not be used.

2.5 STATIC PRESSURE CLASSIFICATION

- A. Static Pressure Classifications: Except where otherwise indicated, construct duct systems to the following pressure classifications:
1. Low Pressure Supply Ducts: 1-inch water gage.
 2. Spiral Medium Pressure Supply Ducts (VAV): 6-inches water gage.
 3. Return Ducts: 1-inch water gage, negative pressure.
 4. Low Pressure Exhaust Ducts: 1-inch water gage, negative pressure.
- B. Cross-breaking or Cross Beading: Cross-break or bead duct sides that are 19 inches and larger and are 20 gage or less, with more than 10 sq. ft. of unbraced panel area, as indicated in SMACNA "HVAC Duct Construction Standard," Figure 1-4, unless they are lined or are externally insulated.

2.6 RECTANGULAR DUCT FITTINGS

- A. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard," 1995 Edition, Figures 2-1 through 2-10.

2.7 MEDIUM PRESSURE ROUND AND FLAT OVAL DUCT FABRICATION

- A. General: "Basic Round Diameter" as used in this article is the diameter of the size of round duct that has a circumference equal to the perimeter of a given size of flat oval duct. Except where interrupted by fittings, provide round and flat oval ducts in lengths not less than 12 feet.
- B. Round Ducts: Fabricate round supply ducts with spiral lock-seam construction, except where diameters exceed 72 inches. Fabricated ducts having diameters greater than 72 inches with longitudinal butt-welded seams. Comply with SMACNA "HVAC Duct Construction Standards," Table 3-2 for galvanized steel gages.
- C. Flat Oval Ducts: Fabricate flat oval supply ducts with standard spiral lock-seams (without intermediate ribs) or with butt-welded longitudinal seams in gages listed in SMACNA "HVAC Duct Construction Standards," Table 3-4.
- D. Double-Wall (Acoustic) Ducts: Fabricate double-wall insulated ducts with an outer shell, insulation, and an inner liner as specified below. Dimensions indicated on double wall ducts are nominal inside dimensions.
1. Thermal Conductivity: 0.27 Btu/sq.ft./deg F/inch thickness at 75 deg F mean temperature.
 2. Outer Shell: Base outer shell gage on actual outer shell dimensions. Provide outer shell lengths 2 inches longer than inner shell and insulation, and in gages specified above for single-wall duct.
 3. Insulation: Unless otherwise indicated, provide 1-inch-thick fiber-glass insulation. Provide insulation ends where internally insulated duct connects to single-wall duct or non-insulated components. The insulation end shall terminate the insulation and reduce the outer shell diameter to the inner liner diameter.
 4. Solid Inner Liner: Construct round and flat oval inner liners with solid sheet metal of the gages listed below. For flat oval ducts, the diameter indicated in the table below is the "basic round diameter."
 5. Perforated Inner Liner: Construct round and flat oval inner liners with perforated sheet metal of the gages listed below. Provide 3/32-inch-diameter perforations, with an overall open area of 23 percent. For flat oval ducts, the diameter indicated below is the "basic round diameter."
 - a. 3 to 8 inches: 28 gage with standard spiral construction.
 - b. 9 to 42 inches: 28 gage with single-rib spiral construction.

- c. 44 to 60 inches: 26 gage with single-rib spiral construction.
 - d. 62 to 88 inches: 22 gage with standard spiral construction.
6. Maintain concentricity of liner to outer shell by mechanical means. Retain insulation from dislocation by mechanical means.

2.8 ROUND AND FLAT OVAL DUCT SUPPLY AND EXHAUST FITTINGS FABRICATION

- A. 90-Degree Tees and Laterals and Conical Tees: Fabricate to conform to SMACNA "HVAC Duct Construction Standards," 1995 Edition, Figures 3-4 and 3-5 and with metal thicknesses specified for longitudinal seam straight duct.
- B. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from the body onto branch tap entrance.
- C. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate the bend radius of die-formed, gored, and pleated elbows 1.5 times the elbow diameter. Unless elbow construction type is indicated, provide elbows meeting the following requirements:
 - 1. Mitered Elbows: Fabricate mitered elbows with welded construction in gages specified below.
 - a. Mitered Elbows Radius and Number of Pieces: Unless otherwise indicated, construct elbow to comply with SMACNA "HVAC Duct Construction Standards," Table 3-1.
 - b. Round Mitered Elbows: Spot welded and bonded with metal thickness listed below for pressure classes from minus 2 inches to plus 2 inches:
 - 1) 3 to 26 inches: 24 gage.
 - 2) 27 to 36 inches: 22 gage.
 - 3) 37 to 50 inches: 20 gage.
 - 4) 52 to 60 inches: 18 gage.
 - 5) 62 to 84 inches: 16 gage.
 - c. Round Mitered Elbows: Spot welded and bonded with metal thickness listed below for pressure classes from 2 inches to 10 inches:
 - 1) 3 to 14 inches: 24 gage.
 - 2) 15 to 26 inches: 22 gage.
 - 3) 27 to 50 inches: 20 gage.
 - 4) 52 to 60 inches: 18 gage.
 - 5) 62 to 84 inches: 16 gage.
 - d. Flat Oval Mitered Elbows: Spot welded and bonded with the same metal thickness as longitudinal seam flat oval duct.
 - e. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems, or exhaust systems for material handling classes A and B; and only where space restrictions do not permit the use of 1.5 bend radius elbows. Fabricate with a single-thickness turning vanes.
 - 2. Round Elbows - 8 Inches and Smaller: Die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend angle configurations or 1/2-inch-diameter (e.g. 3-1/2- and 4-1/2-inch) elbows with gored construction.

3. Round Elbows - 9 Through 14 Inches: Gored or pleated elbows for 30, 45, 60, and 90 degrees, except where space restrictions require a mitered elbow. Fabricate nonstandard bend angle configurations or 1/2-inch-diameter (e.g. 9-1/2- and 10-1/2-inch) elbows with gored construction.
 4. Round Elbows - Larger Than 14 Inches and All Flat Oval Elbows: Gored elbows, except where space restrictions require a mitered elbow.
 5. Die-Formed Elbows for Sizes Through 8 Inches and All Pressures: 20 gage with 2-piece welded construction.
 6. Round Gored Elbows Gages: Same as for non-elbow fittings specified above.
 7. Flat Oval Elbows Gages: Same as longitudinal seam flat oval duct.
 8. Pleated Elbows Sizes Through 14 Inches and Pressures Through 10 Inches: 26 gage.
- D. Double-Wall (Acoustic) Fittings: Fabricate double-wall insulated fittings with an outer shell, insulation, and an inner liner as specified below. Dimensions indicated on internally insulated ducts are nominal inside dimensions.
1. Thermal Conductivity: 0.27 Btu/sq.ft./deg F/inch thickness at 75 deg F mean temperature.
 2. Outer Shell: Base outer shell gage on actual outer shell dimensions. Provide outer shell lengths 2 inches longer than inner shell and insulation. Gages for outer shell shall be same as for uninsulated fittings specified above.
 3. Insulation: Unless otherwise indicated, provide 1-inch-thick fiber-glass insulation. Provide insulation ends where internally insulated duct connects to single-wall duct or non-insulated components. The insulation end shall terminate the insulation and reduce the outer shell diameter to the nominal single-wall size.
 4. Perforated Inner Liner: Construct round and flat oval inner liners with perforated sheet metal of the gages listed below. Provide 3/32-inch-diameter perforations, with an overall open area of 23 percent. For flat oval ducts, the diameter indicated in the table below is the "basic round diameter."
 - a. 3 to 34 inches: 24 gage.
 - b. 35 to 58 inches: 22 gage.
 - c. 60 to 88 inches: 20 gage.
 5. Maintain concentricity of liner to outer shell by mechanical means. Retain insulation from dislocation by mechanical means.

2.9 TYPE B GAS VENTS

- A. Description: Double-wall gas vents, conforming to NFPA 211, Type B. Inner pipe of sheet aluminum, outer pipe of galvanized steel sheet, each with the following minimum thicknesses:
1. Round, 6-Inch Inside Diameter and Smaller: 0.012-inch inner pipe, 0.0187-inch outer pipe.
 2. Round, 7 to 18-Inch Inside Diameter: 0.014-inch inner pipe, 0.0187-inch outer pipe.
 3. Round 20- to 24-Inch Inside Diameter: 0.018-inch inner pipe, 0.0217-Inch outer pipe.
- B. Accessories: Tees, elbows, increasers, draft hood connectors, metal cap with bird barrier, adjustable roof flashing, storm collar, support assembly, thimbles, firestop spacers, and fasteners, fabricated of similar materials and designs as vent pipe straight sections.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

- A. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification indicated.

- B. Install ducts with the fewest possible joints.
- C. Use fabricated fittings for all changes in directions, changes in size and shape, and connections.
- D. Install couplings tight to duct wall surface with projections into duct at connections kept to a minimum.
- E. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Provide clearance of 1 inch where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, if any.
- H. Install insulated ducts with 1-inch clearance outside of insulation.
- I. Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.
- J. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.
- K. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- L. Non-Fire-Rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2 inches.
- M. Low pressure supply duct takeoffs shall be equivalent to Crown 306 or equal by Flexmaster or United McGill. Medium pressure takeoffs shall be conical type.
- N. Low pressure round duct runouts to supply diffusers may be "snap-lock" duct meeting the pressure classification.
- O. Exposed round duct shall be medium pressure spiral duct with mill-phosphatized treatment. Prime and paint - color selected by the Design Professional.

3.2 SEAM AND JOINT SEALING

- A. General: Seal duct seams and joints as follows:
 - 1. Conditioned Spaces:
 - a. Supply duct pressure classification 2-inches water gage and greater and exhaust ducts: All transverse joints and longitudinal seams.
 - b. Supply duct pressure classification less than 2-inches water gage and all return duct: All transverse joints and longitudinal seams.
 - c. Return and Exhaust Duct: All transverse joints and longitudinal seams.
 - 2. Unconditioned Spaces:
 - a. Supply duct pressure classification 2-inches water gage and greater: All transverse joints, longitudinal seams, and duct wall penetrations.

- b. Supply duct pressure classification less than 2-inches water gage and all return duct: All transverse joints, and longitudinal seams.
 - c. Return and Exhaust Duct: All transverse joints.
- 3. Outdoor Spaces:
 - a. All supply and return duct: All transverse joints, longitudinal seams, and duct wall penetrations.
 - b. Exhaust Duct: All transverse joints.
- B. Solvent based sealant shall only be used in applications where freezing may occur before sealant is cured. Water-based sealant shall be used in all other applications.
- C. Seal externally insulated ducts prior to insulation installation.
- D. All duct sealing shall be in accordance with ASHRAE standard 90.1.

3.3 HANGING AND SUPPORTING

- A. Install rigid round, rectangular, and flat oval metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards," Chapter 5.
- B. Support horizontal ducts within 2-feet of each elbow and within 4-feet of each branch intersection.
- C. Support vertical ducts at a maximum interval of 16 feet and at each floor.
- D. Upper attachments to structures shall have an allowable load not exceeding 1/4 of the failure (proof test) load but are not limited to the specific methods indicated.
- E. Install concrete insert prior to placing concrete.
- F. Install powder actuated concrete fasteners after concrete is placed and completely cured.

3.4 CONNECTIONS

- A. Equipment Connections: Connect equipment with flexible connectors in accordance with Division 23 Section "Duct Accessories."
- B. Branch Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-7 and 2-8.
- C. Outlet and Inlet Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-16 through 2-18.
- D. Terminal Units Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figure 2-19.
- E. Low pressure round supply duct takeoffs shall be equivalent to Crown 306 adjustable 45 degree takeoff. Other acceptable manufacturers include, but are not limited to, Flexmaster and United McGill.

3.5 FIELD QUALITY CONTROL

- A. Disassemble, reassemble, and seal segments of the systems as required to accommodate leakage testing, and as required for compliance with test requirements.

- B. All ductwork shall be approved by the Design Professional prior to the application of external insulation. In the absence of such approval, smoke testing, pressure testing or other leakage testing of ductwork shall be required.
- C. Conduct duct pressure tests in the presence of the Design Professional after the testing has demonstrated that the duct system meets the stated leakage criteria.
- D. Determine leakage from entire medium pressure system or section of the system by relating leakage to the total system airflow capacity.
- E. The following systems shall be pressure tested in accordance with SMACNA's HVAC Air Duct Leakage Test Manual, and meet the stated criteria:
 - 1. Medium pressure supply ductwork: test at 4.5 inches water column static pressure, with a maximum allowable leakage rate of 0.5%.
 - 2. Low pressure supply ductwork: test at 1.0 inches water column static pressure, with a maximum leakage of 1%.
 - 3. Low pressure return and exhaust ductwork: test at 1.0 inches water column static pressure, with a maximum leakage of 1%.
- F. Do not pressurize systems above the maximum design operating pressure (static pressure classification.) Give 7 days' advanced notice for testing.
- G. Remake leaking joints as required and apply sealants to achieve specified maximum allowable leakage. Integrity of ductwork shall be approved by the Design Professional prior to application of insulation.

3.6 ADJUSTING AND CLEANING

- A. Adjust volume control devices as required by the testing and balancing procedures to achieve required air flow. Refer to Division 23 Section "TESTING, ADJUSTING, AND BALANCING" for requirements and procedures for adjusting and balancing air systems.
- B. Vacuum ducts systems prior to final acceptance to remove dust and debris.

END OF SECTION 23 31 13

DIVISION 23 - HVAC
SECTION 23 33 00 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
1. Manual volume control dampers.
 2. Turning vanes.
 3. Duct-mounted access doors and panels.
 4. Flexible connectors.
 5. Fabric ducts.
 6. Accessories hardware.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 23 Section "Diffusers, Registers, Grilles and Louvers" for diffusers, registers, and grilles.
 2. Division 23 Section "Air Terminals" for constant and variable air volume units.
 3. Division 23 Section "Controls Systems Equipment" for HVAC control devices.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract.
- B. Product data including details for materials, dimensions of individual components, profiles, and finishes for the following items:
1. Manual volume control dampers.
 2. Duct-mounted access panels and doors.
 3. Flexible ducts.
 4. Pre-insulated, outdoor ductwork.
- C. Shop drawings from manufacturer detailing assemblies. Include dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection. Detail the following:
1. Special fittings and volume control damper installation (both manual and automatic) details.
- D. Product Certification: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static pressure loss, and dimensions and weights.
- E. Maintenance data for volume control devices, fire dampers, and smoke dampers

1.4 QUALITY ASSURANCE

- A. NFPA Compliance: Comply with the following NFPA Standards:

1. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."
 2. NFPA 90B, "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."
- B. U.L. Listing: Pre-insulated, outdoor ductwork shall meet U.L. 181, U.L. 723, and U.L. 94 Standards.

1.5 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: A written warranty, executed by the manufacturer and signed by the Contractor, agreeing to replace components that fail in materials or workmanship, within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.
1. Warranty Period, Fabric Duct: Manufacturer's standard but not less than 10 years for fabric components of the system.
 2. Warranty Period, pre-insulated, outdoor ductwork: Manufacturer's standard but not less than 10 years for all system components.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Protect items from damage during shipping, storage and handling.
- B. Where possible, store products inside and protect from weather. Where necessary to store outside, store above grade and enclose with a vented waterproof wrapping.

PART 2 - PRODUCTS

2.1 MANUAL VOLUME CONTROL DAMPERS

- A. General: Provide factory-fabricated volume-control dampers, complete with required hardware and accessories. Stiffen damper blades to provide stability under operating conditions. Provide locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class. Provide end bearings or other seals for ducts with pressure classifications of 3 inches or higher. Extend axles full length of damper blades. Provide bearings at both ends of operating shaft.
- B. Standard Volume Control Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside of air stream, and suitable for horizontal or vertical applications.
1. Steel Frames: Hat-shaped, galvanized-steel channels, minimum of 16 gage, and with mitered and welded corners. Provide frames with flanges where indicated for attaching to walls. Provide flangeless frames where indicated for installation in ducts.
 2. Roll-Formed Steel Blades: 16-gage galvanized steel.
 3. Blade Axles: Galvanized steel.
 4. Tie Bars and Brackets: Galvanized steel.

- C. Low-Leakage Volume Control Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, low-leakage rating, with linkage outside of air stream, and suitable for horizontal or vertical applications. Dampers shall have a maximum leakage of 10 cfm per square foot of 4-inch static pressure.
- D. Low-Leakage Volume Control Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, low-leakage rating, and suitable for horizontal or vertical applications. Leakage shall be less than 10 cfm at 3.0 inches differential static pressure.
 - 1. Aluminum Frames: Hat-shaped, 0.063-inch-thick, 6063T extruded aluminum channels. Provide frames with flanges where indicated for attaching to walls. Provide flangeless frames where indicated for installation in ducts.
 - 2. Roll-Formed Aluminum Blades: 0.025-inch-thick roll-formed aluminum.
 - 3. Extruded Aluminum Blades: 0.050-inch-thick 6063T extruded aluminum.
 - 4. Blade Seals: Felt.
 - 5. Blade Seals: Vinyl.
 - 6. Blade Seals: Neoprene.
 - 7. Blade Axles: Nonferrous.
 - 8. Tie Bars and Brackets: Aluminum.

2.2 TURNING VANES

- A. Fabricate turning vanes according to SMACNA HVAC Duct Construction Standards, Figures 2-2 through 2-7.
- B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch-wide, curved blades set at 3/4 inch on center, support with bars perpendicular to blades set at 2 inches on center and set into side strips suitable for mounting in ducts.
- C. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fiber glass fill.

2.3 DUCT-MOUNTED ACCESS DOORS AND PANELS

- A. General: Provide construction and airtightness suitable for duct pressure class.
- B. Frame: Galvanized sheet steel. Provide with bend-over tabs and foam gaskets.
- C. Door: Double-wall, galvanized sheet metal construction with insulation fill and thickness, number of locks as indicated for duct pressure class. Provide vision panel where indicated. Provide cam latches.
- D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber seals.
- E. Insulation: 1-inch-thick fiber glass or polystyrene foam board.

2.4 FLEXIBLE CONNECTORS

- A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL Standard 181, Class 1.
- B. Standard Metal-Edged Connectors: Factory-fabricated with a strip of fabric 3-1/2 inches wide attached to 2 strips of 2-3/4-inch-wide, 24-gage, galvanized sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected duct system. Fold and crimp metal edge strips onto fabric as illustrated in SMACNA HVAC Duct Standard, 3rd Edition, Figure 7-8.

- C. Extra-Wide Metal-Edged Connectors: Factory-fabricated with a strip of fabric 5-3/4 inches wide attached to 2 strips of 2-3/4-inch-wide, 24-gage, galvanized sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected duct system. Fold and crimp metal edge strips onto fabric as illustrated in SMACNA HVAC Duct Standard, 1st Edition, Figure 2-19.
- D. Transverse Metal-Edged Connectors: Factory-fabricated with a strip of fabric 3-1/2 inches wide attached to 2 strips of 4-3/8-inch-wide, 24-gage, galvanized sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected duct system. Fold and crimp metal edge strips onto fabric as illustrated in SMACNA HVAC Duct Standard, 1st Edition, Figure 2-19.
- E. Conventional, Indoor System Flexible Connectors Fabric: Glass fabric double coated with polychloroprene.
 - 1. Minimum Weight: 26 oz./sq. yd.
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
- F. Conventional, Outdoor System Flexible Connectors Fabric: Glass fabric double coated with Du Pont's HYPALON or other synthetic-rubber weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.
 - 1. Minimum Weight: 26 oz./sq. yd.
 - 2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
 - 3. High-Temperature System Flexible Connectors: Glass fabric coated with silicone rubber and having a minimum weight of 16 oz./sq. yd. and tensile strength of 285 lbf/inch in the warp, and 185 lbf/inch in the filling.
- G. High-Corrosive-Environment System Flexible Connectors: Glass fabric coated with a chemical-resistant coating.
 - 1. Minimum Weight: 14 oz./sq. yd.
 - 2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.

2.5 FLEXIBLE DUCTS

- A. General: Comply with UL 181, Class 1.
- B. Flexible Ducts - Uninsulated: Spiral-wound steel spring with flameproof vinyl sheathing.
- C. Flexible Ducts - Uninsulated: Corrugated aluminum.
- D. Flexible Ducts - Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch-thick, glass fiber insulation around a continuous inner liner.
 - 1. Reinforcement: Steel-wire helix encapsulated in the inner liner.
 - 2. Outer Jacket: Glass-reinforced, silver mylar.
 - 3. Inner Liner: Polyethylene film.
 - 4. Pressure Rating: 10-inches wg, positive.
 - 5. R value = 6.0
- E. Woven Polypropylene Hanging Strap:
 - 1. Hanging straps shall be manufactured of woven polypropylene 1 3/4" wide and having a minimum 400-pound tensile strength.
 - 2. Strap material shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50.

3. Strap material shall be manufactured for flexible HVAC duct support and shall be installed in accordance with the manufacturer's instructions and SMACNA standards.
4. Straps shall be used on flexible ducts only, and not on rigid ductwork.

2.6 ACCESSORIES HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket and a flat mounting gasket. Size to allow insertion of pitot tube and other testing instruments and provide in length to suit duct insulation thickness.
- B. Splitter Damper Accessories: Zinc-plated damper blade bracket, 1/4-inch, zinc-plated operating rod, and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.
- C. Flexible Duct Clamps: Stainless steel band with cadmium-plated hex screw to tighten band with a worm-gear action. Provide in sizes from 3 to 18 inches to suit duct size.
- D. Adhesives: High strength, quick setting, neoprene based, waterproof and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of duct accessories. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install duct accessories according to manufacturer's installation instructions and applicable portions of details of construction as shown in SMACNA standards.
- B. Install volume control dampers in lined duct with methods to avoid damage to liner and to avoid erosion of duct liner.
- C. Provide test holes at fan inlet and outlet and elsewhere as indicated.
- D. Install fire and smoke dampers according to the manufacturer's UL-approved printed instructions.
- E. Install fusible links in fire dampers.

3.3 ADJUSTING

- A. Adjust duct accessories for proper settings.
- B. Final positioning of manual dampers is specified in Division 23 Section "Testing, Adjusting, and Balancing."

END OF SECTION 233300

DIVISION 23 - HVAC
SECTION 23 37 13 - DIFFUSERS, REGISTERS, GRILLES AND LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

1.3 DEFINITIONS

- A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.
- B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.
- C. Register: A combination grille and damper assembly over an air opening.

1.4 SUBMITTALS

- A. Product Data: For each model indicated, include the following:
 - 1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
 - 2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
 - 3. Schedule of diffusers, registers, grilles and louvers indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
 - 4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.
- B. Coordination Drawings: Reflected ceiling plans and wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other items installed in ceilings and walls.

1.5 QUALITY ASSURANCE

- A. Product Options: Drawings and schedules indicate specific requirements of diffusers, registers, grilles and louvers and are based on the specific requirements of the systems indicated. Other manufacturers' products with equal performance characteristics may be considered.
- B. NFPA Compliance: Install diffusers, registers, grilles and louvers according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."
- C. UL Standards: Fan filter diffusers shall be Listed in accordance with UL 507, "Standard for Electric Fans," and UL 900, "Standard for Air Filter Units."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Acceptable manufacturers shall be:
 - 1. Anemostat Products
 - 2. Arrow
 - 3. Carnes Co.
 - 4. Greenheck
 - 5. Hart and Cooley
 - 6. Tuttle and Bailey
 - 7. Krueger
 - 8. J&J
 - 9. Nailor
 - 10. Titus
 - 11. Metal*Aire
 - 12. Vent Products
 - 13. Price
 - 14. Dowco
 - 15. Ruskin
- B. All louver face ceiling diffusers shall have four cones and removable cores.
- C. All exterior louvers shall be 6-inches deep.

2.2 SOURCE QUALITY CONTROL

- A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, grilles and louvers are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, grilles and louvers level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where Design Professional features or other items conflict with installation, notify Design Professional for a determination of final location.
- C. Install diffusers, registers, grilles and louvers with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

- A. After installation of diffusers, registers, and grilles inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION 23 37 13

DIVISION 23 - HVAC
SECTION 23 40 00 – BIPOLAR IONIZATION AIR PURIFICATION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This section describes the design, performance and installation of a bipolar ionization air purification system intended for use as part of another manufacturer's air handling unit or mounted on the duct as shown on the plans, details and equipment schedules.

1.3 REFERENCED CODES & STANDARDS

- A. The following codes and standards are referenced throughout. The edition to be used is that currently enforced by the authority having jurisdiction (AHJ) or in absence of such direction that referenced by the current enforceable IBC code or as indicated by the contract documents, except where specifically referenced by this section of the specifications.
 - 1. ASHRAE Standards 62 & 52
 - 2. National Electric Code NFPA 70
 - 3. UL 867

1.4 QUALITY ASSURANCE

- A. The bipolar ionization air purification system shall be a product of an established manufacturer in the USA.
- B. A qualified representative from the manufacturer shall be available to inspect the installation of the air purification system to ensure installation in accordance with manufacturer's recommendation.
- C. Technologies that do not address gas disassociation such as UV lights, powered particulate filters and/or polarized media filters shall not be considered. Uni-polar ion generators shall not be acceptable. "Plasma" particulate filters shall not be acceptable.
- D. Projects designed using ASHRAE Standard 62.1 *IAQ Procedure* shall require the manufacturer to provide Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2007 or later version to validate acceptable indoor air quality at the quantity of outside air scheduled.
- E. The bipolar ionization system shall have been tested by UL or Intertek/ETL to prove conformance to UL 867-2007.
- F. The maximum allowable ozone concentration per the UL 867-2007 chamber test shall be 0.001 PPM. The maximum peak ozone concentration per the UL 867-2007 peak test as measured 2 inches away from the output of the bipolar ionization unit shall be no more than 0.0012 PPM. Manufacturers with ozone output exceeding these ozone values shall not be acceptable.
- G. Electrical Component Standard: Provide components that comply with NFPA 70 "National Electrical Code."
- H. NEMA Compliance: Provide electrical components required as part of filter assembly that are listed and labeled by UL and comply with applicable NEMA standards.

- I. Listing and Labeling: Provide electrical components that are listed and labeled.
 - 1. The Terms "Listed and Labeled": As defined in the "National Electrical Code," Article 100.
- J. NFPA Compliance: Comply with applicable portions of NFPA 90A and 90B.

1.5 SUBMITTALS

- A. Submit manufacturer's technical product data for ion generators including:
 - 1. Schedule of bipolar ionization units indicating model number and quantity of each type required for each application.
 - 2. Submittal sheet for each type of bipolar ionization unit and accessories furnished; indicating construction, dimensions, electrical data, and mounting details.
 - 3. Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.1-2007 or later version to validate acceptable indoor air quality at the quantity of outside air scheduled (when projects are designed with reduced outside air).
 - 4. Product drawings detailing all physical, electrical and control requirements.
- B. Operating & Maintenance Data: Submit O&M data and recommended spare parts list.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of products shall be in factory fabricated shipping cartons. Identify on outside of carton the type of product contained within. Avoid crushing or bending.
- B. Store in original cartons and protect from weather and construction work traffic.
- C. Store indoors and in accordance with the manufacturers' recommendation for storage.

1.7 WARRANTY

- A. Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of twelve months after shipment or eighteen months from owner acceptance, whichever occurs first. Labor to replace equipment under warranty shall be provided by the owner or installing contractor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Aerisa
 - 2. Air Oasis
 - 3. Bioclimatic
 - 4. Global Plasma Solutions (GPS)
 - 5. Plasma Air

2.2 GENERAL

- A. The air purification system(s) shall be of the size, type, arrangement and capacity indicated and required by the unit scheduled.

- B. All other suppliers of comparable products requesting prior approval shall:
 - 1. Submit a request for prior approval at least 15 days prior to bid date. Requests received after that time will not be considered.
 - 2. In addition, as part of the prior approval request, Bipolar Ionization manufacturers must submit their IAQ calculations that prove conformance to ASHRAE Standard 62.1-2007 or later version with the reduction of outside air to the scheduled values. A letter on the manufacturer's letterhead requesting prior approval must accompany the request for prior approval stating their calculations are ASHRAE compliant. A third-party validation study performed on a previous installation of the same application shall also be included.
 - 3. Submit independent test data from ETL or UL on the ozone chamber test.
 - 4. Submit at least two other end user references in the same application with contact phone number, email, equipment used and application at that facility. Manufacturers not having the above references in similar applications using the same equipment models as proposed on the current project shall not be acceptable.

2.3 BI-POLAR IONIZATION DESIGN & PERFORMANCE CRITERIA

- A. Each piece of air handling equipment, so designated on the plans, details, equipment schedules and/or specifications shall contain a plasma ion generator with bipolar ionization output as described here within.
- B. The bipolar ionization system shall be capable of:
 - 1. Effectively killing microorganisms downstream of the bipolar ionization equipment (e.g., mold, bacteria, virus).
 - 2. Controlling gas phase contaminants generated from human occupants, building structure, furnishings and outside air contaminants.
 - 3. Reducing space static charges.
 - 4. Reducing space particle counts.
- C. The bipolar ionization system shall operate in such a manner that equal amounts of positive and negative ions are produced. Uni-polar (or single pole) ion devices shall not be acceptable.
 - 1. Airflow rates may vary through the full operating range of a VAV system. The quantity of air exchange shall not be increased due to requirements of the air purification system.
 - 2. Velocity Profile: The air purification device shall not have a maximum velocity profile.
- D. Humidity: Plasma Generators shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100%, condensing, shall not cause damage, deterioration or dangerous conditions to the air purification system.
- E. Ionization Equipment Requirements:
 - 1. Electrode Specifications (bipolar ionization):
 - a. Each plasma generator with bipolar ionization output shall include the required number of electrodes and power generators sized to the air handling equipment capacity. Bipolar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, performance output reduction over time and corrosion.
 - b. Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating.

- c. Ionization output from each electrode shall be a minimum of 5-million ions/cc when tested at 2" from the ion generator.
 - d. Manufacturer shall demonstrate that no voltage potential exists due to exposed electrical components in the duct system or plenum.
2. Units Mounted in Airstream:
 - a. Bipolar ionization units for fan-mounted and duct-mounted applications shall be brush type needlepoint units.
 - b. Each bipolar ionization unit shall be rated for the airflow it will be treating.
 - c. The bipolar unit housing is made of acrylonitrile butadiene styrene, contains an LED ionization output-indicator, and an in-line 1 Amp fuse
 - d. The unit shall contain two (2) mounting feet such that when mounted, the needlepoint brushes are oriented perpendicular to the flow.
 - e. Provide self-cleaning accessories to periodically clean electrodes.
 3. Certifications
 - a. Bipolar ionization units shall be tested and listed by either UL or ETL according to UL Standard 867 – Electrostatic Air Cleaners.
 - b. The operation of the electrodes or bipolar ionization units shall conform to UL 867 with respect to ozone generation.
- F. Electrical Requirements:
1. Ion generators shall directly accept voltage provided from the voltage provided from the fan coil unit or air handling unit served. Ion generators requiring a loose transformer or power supply will not be accepted.
 2. Wiring, conduit and junction boxes shall be furnished and installed by the electrical contractor within housing plenums and shall be UL and NEC NFPA 70 approved.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall be responsible for maintaining all air systems until the owner accepts the building (Owner Acceptance).

3.2 ASSEMBLY & INSTALLATION: PLASMA GENERATOR WITH BI-POLAR IONIZATION

- A. All equipment shall be assembled and installed with a high level of workmanship to the satisfaction of the Owner and Design Professional.
- B. Any material damaged by handling, water or moisture shall be replaced by the mechanical contractor at no cost to the owner.
- C. All equipment shall be protected from damage on a daily basis throughout construction.
- D. Install electrical devices in accordance with manufacturer's instructions and with electrical divisions of the specifications.

3.3 COMMISSIONING & TRAINING

- A. A manufacturer's authorized representative shall provide start-up supervision and training of owner's personnel in the proper operation and maintenance of all equipment.

END OF SECTION 23 40 00

DIVISION 26 - ELECTRICAL
SECTION 26 00 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 SUMMARY

- A. This Division of the specifications (260000) covers the complete interior and exterior electrical system for all work shown on the drawings as specified herein providing all material, labor and equipment required for the installation of the electrical systems complete and in operating condition.
- B. Include in the electrical work all the necessary supervision and the issuing of all coordinating information to any other trades who are supplying work to accommodate the electrical installations.
- C. Submittal, Record Drawing and Operation and Maintenance Manual Procedures.

1.02 SUBMITTALS REQUIRED

- A. Equipment connection coordination letter.
- B. Utility Provider(s) coordination letters.

1.03 COORDINATION

- A. This Contractor shall schedule his work and, in every way, possible cooperate with all other Contractors on the job to avoid delays, interferences, and unnecessary work. He shall notify them of all openings, hangers, excavations, etc., so that proper provisions shall be made for his work. This shall not relieve him of the cost of cutting, when such is required.
- B. This Contractor shall do all cutting and excavating necessary for the complete installation of his work, but he shall not cut the work of any other Contractor without first consulting the Architect. He shall repair any work damaged by him or his workmen, employing the services of the Contractor whose work is damaged.
- C. This Contractor shall by all means coordinate the location of recessed ceiling lighting fixtures, with the Ceiling Contractor so that proper hangers and supports shall be provided.
- D. Any conflict between electrical and other trades shall be reported before construction starts. No extra charges will be approved for work resulting from failure to coordinate with other trades.
- E. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

- F. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- G. Coordinate sleeve selection and application with selection and application of fire stopping.

1.04 DRAWINGS

- A. The drawings for electrical work utilize symbols and schematic diagrams which have no dimensional significance. The work shall therefore, be installed to fulfill the diagrammatic intent expressed on the electrical drawings.
- B. Review architectural drawings for door swings, cabinets, counters, moldings and built-in equipment, conditions indicated on architectural drawings shall govern. Prior to rough-in of receptacles and systems outlets refer to architectural casework drawings for rough-in coordination.
- C. Coordinate electrical work with the architectural details, floor plans, elevations, structural and mechanical drawings. Provide fittings, junction boxes and accessories to meet conditions.
- D. Do not scale drawings. Dimensions for layout of equipment, or spaces shall be obtained from architectural, structural or mechanical drawings unless specifically indicated on the electrical drawings.
- E. Discrepancies shown on different drawings, between drawings and specifications or between drawings and field conditions shall be promptly brought to the attention of the Architect.
- F. Provide as used on the drawings and in the specifications shall mean, furnish, install, connect, adjust and test.
- G. The drawings and specifications are complimentary and any work or material shown in one and omitted in the other, or described in the one and not shown in the other, or which may be implied by both or either, shall be furnished as though shown on both, in order to give a complete and first class installation.

1.05 CODES AND PERMITS:

- A. All electrical work shall meet or exceed the latest requirements of the following codes and/or other authorities exercising jurisdiction over the electrical construction work and the project.
 - 1. The National Electrical Code (NFPA 70) - 2020 Edition
 - 2. The National Electrical Safety Code (ANSI C-2)
 - 3. The Life Safety Code (NFPA 101) - Georgia - 2018 Edition
 - 4. The International Building Code - 2018 Edition
 - 5. Regulations of the local utility company with respect to metering and service entrance.
 - 6. Municipal and State ordinances governing electrical work.
- B. All required permits and inspection certificates shall be obtained, and made available at the completion of the work. Permits, inspections, and certification fees shall be paid for as a part of the electrical work.

1.06 EQUIPMENT CONNECTIONS:

- A. All equipment requiring electrical power connections shall be connected under this Division of these specifications.
- B. Where electrical connections to equipment require specific locations, such locations shall be obtained from shop drawings.
- C. Drawings for location of conduit stub-up boxes mounted in wall or floor to serve specific equipment shall not be scaled.
- D. Where equipment is indicated to be served thru conduit stub-up, conduit shall be stubbed up not less than four inches above floor where transition shall be made to sealtite flexible conduit for connection to equipment.
- E. The Contractor's attention is invited to other Divisions of these specifications, where equipment requiring electrical service or electrically related work is specified to become fully aware of the scope of work required for electrical service or related work.
- F. Where electricity utilizing equipment is supplied separate from the electrical work, and is energized, controlled or otherwise made operative by electrical work, the testing to provide the proper functional performance of such wiring systems shall be conducted by the trade responsible for the equipment. The electrical work shall, however, include cooperation in such testing and the making available of any necessary testing or adjustments to the electrical equipment.
- G. Heating, air conditioning, and ventilating equipment is specified to be furnished and installed under other sections of these specifications. The controls likewise are specified to be furnished there under. All necessary wiring, wiring troughs and circuit breakers for power for this equipment shall be furnished and installed under this section of the specifications, in accordance with the plans and/or diagrams furnished with the equipment, or shown on these plans. Starters furnished by the Mechanical Contractor shall be installed under this Division of the specifications. Power wiring to auxiliary equipment on a piece of equipment remote from its main terminal box and interlocking of apparatus shall be accomplished under Heating Ventilating Equipment section of the specifications. Conduit and outlets for control wiring shall be furnished and installed under Division 23 of these specifications. Control conductors for mechanical equipment shall not be installed in same conduit with power conductors.

1.07 GUARANTEE:

- A. Defective lamps shall be replaced up-to-date of acceptance and shall be guaranteed for entire length of warranty as specified by the Architect.
- B. All systems and component parts shall be guaranteed entire length of warranty as specified by the Architect from the date of final acceptance of the complete project. Defects found during this guaranteed period shall be promptly corrected at no additional cost to the Owner.

1.08 PRODUCT DATA, SAMPLES AND SHOP DRAWINGS SUBMITTAL PROCEDURE

- A. See Division 26 – Electrical Submittal Procedures specification section.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Materials specified by manufacturer's name shall be used unless approval of other manufacturers is listed in addenda to these specifications.
- B. Drawings indicating proposed layout of space, all equipment to be installed therein and clearance between equipment shall be submitted, where substitution of materials alter space requirements on the drawings.
- C. Material Standards: All materials shall be new and shall conform to the standards where such have been established for the particular material in question. Publications and Standards of the organization listed below are applicable to materials specified herein.
 - 1. American Society for Testing and Materials (ASTM)
 - 2. Underwriter's Laboratories, Inc. (UL)
 - 3. National Electrical Manufacturer Association (NEMA)
 - 4. Insulated Cable Engineers Association (ICEA)
 - 5. Institute of Electrical and Electronic Engineers (IEEE)
 - 6. National Fire Protection Association (NFPA)
 - 7. American National Standards Institute (ANSI)
- D. Material of the same type shall be the product of one manufacturer.
- E. Materials not readily available from local sources shall be ordered immediately upon approval.
- F. The Architect shall have authority to reject any materials, or equipment, not complying with these specifications and have the Contractor replace materials so rejected immediately upon notification of rejection.
- G. Any material or equipment so rejected shall be removed from the job within 24 hours of such rejection; otherwise the Architect may have same removed at the Contractor's expense.

2.02 PRODUCT DELIVERY, STORAGE, HANDLING, & PROTECTION

- A. Inspect materials upon arrival at Project and verify conformance to Contract Documents. Prevent unloading of unsatisfactory material. Handle materials in accordance with manufacturer's applicable standards and suppliers recommendations, and in a manner to prevent damage to materials. Store packaged materials in original undamaged condition with manufacturer's labels and seals intact. Containers which are broken, opened, damaged, or watermarked are unacceptable and shall be removed from the premises.
- B. All material, except items specifically designed to be installed outdoors such as pad mounted transformers or stand-by generators, shall be stored in an enclosed, dry building or trailer. Areas for general storage shall be provided by the Contractor. Provide temperature and/or humidity control where applicable. No material for interior installation, including conductors, shall be stored other than in an enclosed weather tight structure. Equipment stored other than as specified above shall be removed from the premises.
- C. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Conditions shall be those for which the

equipment or materials are designed to be installed. Equipment and materials shall be protected from water, direct sunlight, cold or heat. Equipment or materials damaged or which are subjected to these elements are unacceptable and shall be removed from the premises and replaced.

PART 3 - EXECUTION

3.01 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.
- F. Raceways, fixtures, devices, and other electrical equipment shall be installed in a neat and workmanlike manner.
- G. The Architect or his representative shall have the authority to reject any workmanship not complying with the contract documents.
- H. The Electrical Contractor shall personally or through an authorized licensed and competent electrician, constantly supervise the work from beginning to complete and final inspection.
- I. Electrical equipment shall be installed in accordance with manufacturer's recommendations.
- J. Locations of proposed raceway, riser, location of structural elements, location and size of chases method and type of construction of floors, walls, partitions, etc., shall be verified before construction starts.
- K. All empty conduits shall have a pull string installed. All flush recessed boxes shall have blank plates installed.

3.02 CLEANING AND PAINTING

- A. Remove oil, dirt, grease and foreign materials from all raceways, fittings, boxes, panelboard trims and cabinets to provide a clean surface for painting. Touch-up scratched or marred surfaces of lighting fixtures, panelboard and cabinet trims, motor control center, switchboard or equipment enclosures with paint furnished by the equipment manufacturers specifically for that purpose.
- B. Do not paint trim covers for flush mounted panelboards, telephone cabinets, pull boxes, junction boxes and control cabinet unless required by the Architect. Remove trim covers before painting. Under no conditions shall locks, latches or exposed trim clamps be painted.

- C. Unless indicated on the drawings or specified herein to the contrary, all painting shall be done under the PAINTING Section of these Specifications.
- D. Where plywood backboards are used to mount equipment provided under Division 26, paint backboards with two coats of light grey semi-gloss paint. Plywood shall be 3/4" fire rated plywood. Paint shall be fire retardant paint.

3.03 DEVIATIONS:

- A. No deviations from the plans and specifications shall be made without the full knowledge and consent of the Architect or his authorized representative.
- B. Should the Contractor find at any time during progress of the work that, in his judgment, existing conditions make desirable a modification in requirements covering any particular item or items, he shall report such items promptly to the Architect for his decision and instruction.

3.04 FIRESTOPPING

- A. Apply fire stopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly.

3.05 CONSTRUCTION REVIEWS

- A. The Architect or his representative shall observe and review the installation of all electrical systems shown on the drawings and as specified herein.
- B. Before covering or concealing any conduit below grade or slab, in wall or above ceiling, the contractor shall notify the Architect so that he can review the installation.

3.06 CONTRACTOR'S FINAL INSPECTION

- A. Contractor shall refer to individual electrical specification sections for all testing, commissioning and training requirements specific to each section.
- B. At the time of the Contractor's final inspection, all systems shall be checked and tested for proper installation and operation by the Contractor in the presence of the Architect or his representative.
- C. The Contractor shall furnish the personnel, tools and equipment required to inspect and test all systems.
- D. Following is a list of items that the contractor must demonstrate to the Architect or his representative as complying with the plans and specifications. Please note that this list does not necessarily represent all items to be covered in the final inspection, but should give the Contractor an idea of what is to be reviewed.
 - 1. Service ground to 30 KVA dry type transformer, show connection to ground rod and cold water main.
 - 2. Demonstrate that all panels have breakers as specified, ground bar, copper bus, typed directory for circuit identification and that they are free of trash.
 - 3. Demonstrate that all conduits are supported as required by the National Electrical Code.

4. Demonstrate that all conductors (MC cable) are supported accordingly. This should include all branch circuit neutral conductor striping.
5. Demonstrate that all outlet boxes above or on the ceiling are supported as required by the National Electrical Code.
6. Demonstrate that outlet boxes in wall or ceilings of combustible materials are flush with surface of wall or ceiling, and that outlet boxes in walls or ceilings of non-combustible materials are so installed that the front edge of the box or plaster ring is not set back more than 1/4".
7. Demonstrate that outlet boxes in wall are secure.
8. Demonstrate that all devices are properly secured to boxes, that device plates are properly aligned and are not being used to secure device.
9. Utilizing a Woodhead No. 1750 testing device, demonstrate that all 125 volt receptacles are properly connected.
10. Demonstrate that all fixtures have specified lamps, ballast and lens, and that they are supported as required by the National Electrical Code or as called for on the drawings or in the specifications.
11. Demonstrate that Fire Alarm System is in proper working order, initiating an alarm signal from each manual and automatic device (including smoke detectors).
12. Demonstrate that Intercom System is in proper working order and meeting all requirements outlined in specifications.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 00 05 - ELECTRICAL SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes requirements for the preparation of Electrical Division 26 Shop Drawings, Product Data, Samples, and other submittals.

PART 2 - PRODUCTS

2.01 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
- B. All submittals shall be submitted in electronic format.
- C. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
 - 1. Assemble complete submittal package into indexed files incorporating submittal requirements of each single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
 - 3. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner, containing the following information for EACH SECTION:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Construction Manager/General Contractor.
 - e. Name of Electrical Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Specification Section number and title.
 - i. Indication of full or partial submittal.
- D. Options: Identify options requiring selection by Architect.
- E. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents,

including minor variations and limitations. Include same identification information as related submittal.

- F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

2.02 SUBMITTAL DATA – REFER TO EACH SPECIFICATION SECTION FOR REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. Mark each copy of each submittal to show which products and options are applicable.
 - 2. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 - 3. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 - 4. Submit Product Data before or concurrent with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- D. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

PART 3 - EXECUTION

3.01 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.02 ENGINEER'S ACTION

- A. Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it.
- B. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- C. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 05 23 - METAL CLAD CABLE (TYPE MC) AND FITTINGS

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Shop drawings shall be submitted and shall consist of manufacturer's published literature. Submit manufacturer's literature for each type cable and fitting used in the project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable manufacturers are:
1. Southwire
 2. AFC
 3. Nexans Energy
- B. All wiring shall be manufactured in the United States.

2.02 STANDARDS

- A. Provide metal-clad cable that complies with UL Standard 1569, National Electric Code and this specification.
- B. All electrical equipment and materials shall be new and within one year of manufacture, complying with all the latest codes and standards. No used, re-built, refurbished and/or re-manufactured electrical equipment and materials shall be furnished on this project.
- C. Deliver materials to site in unopened cartons or bundles as appropriate, clearly identified with manufacturer's name, Underwriter's or other approved label, grade or identifying number.

2.03 MATERIALS

- A. Cable
1. Metal-clad cable shall consist of THHN insulated solid copper circuit conductors, an insulated solid copper equipment grounding conductor, a Mylar wrapping around the conductor bundle, and a close fitting aluminum or galvanized steel outer sheath. The equipment ground wire shall be of the same construction and be the same size as the current carrying conductors, bare aluminum grounding conductor are not acceptable. The insulation color shall be green.
 2. Provide minimum 12 AWG conductors in Type MC cables.
 - a. Provide larger conductor sizes as required to limit branch circuit voltage drop to 3 percent at the full connected load.
 - b. Use larger conductor sizes to adjust allowable ampacity if there are more than 3 current-carrying conductors in a cable.

- c. For isolated ground power circuits provide Type MC cables with a separate neutral conductor for each phase conductor; uniquely identify each neutral with a colored stripe on the white insulation corresponding to the phase conductor insulation color.
 3. Provide MC cables with the same conductor color coding as specified below:
 - Phase A: Black
 - Phase B: Red
 - Phase C: Blue
 - Neutral: White
 4. PVC jacketing where required shall be flame-retardant PVC with a temperature range of -400C to 900C.
- B. Fittings
1. Fittings shall be UL listed and identified for such use with metal clad continuous corrugated sheath cable, with or without PVC jacketing, as is appropriate for the installation.
 2. Connectors shall be steel set screw type with insulated throat and locknut for non-jacketed metal clad cable. Compression gland type connectors shall be used for jacketed metal clad cable.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Metal clad cable shall be utilized for 15 and 20 ampere branch circuit wiring beyond the first outlet or junction box. Contractor to dictate if MC cable or conduit shall be utilized for the homerun from the first outlet or junction box to the branch circuit panelboard. Utilize most cost efficient method.
- B. Metal clad cable shall be utilized in interior, dry locations where they will be concealed above ceilings, in dry-wall partitions, in equipment enclosures, or below raised floors. Type MC cables may be installed exposed in dedicated electrical rooms and mechanical rooms if they will not be exposed to physical damage or deteriorating agents.
- C. Metal clad cables shall be securely fastened in place at intervals of not more than six feet, with suitable clamps or fasteners of approved type, and all vertical conduits shall be properly supported to present a mechanically rigid and secure installation. Zip ties, ty-wraps, and plastic fasteners are not allowed nor are they an acceptable means of support for fastening.
- D. Metal clad cable shall be supported immediately on each side of a bend and not more that one (1) foot from an enclosure where a run of metal clad cable ends. Bends shall be made so that the cable will not be damaged.
- E. Where metal clad cables are exposed, run parallel with walls or structural elements. Vertical runs shall be plumb; horizontal runs level and parallel with structure, as appropriate. Groups shall be racked together neatly with both straight runs and bends parallel and uniformly spaced.
- F. Maintain at least 6-inch clearance between metal clad cables and other piping systems. Maintain 12-inch clearance between metal clad cables and heat sources such as flues, steam pipes, and heating appliances.
- G. No metal clad cable shall be fastened to other conduits or pipes or installed so as to prevent the ready removal of other pipes or ducts for repairs.

- H. Where three (3) or more metal clad cables are suspended from the ceiling in parallel runs, use steel channels, Kindorf, Unistrut or equal, hung from 1/2-inch rods to support the conduits. The conduit on these channels shall be held in place with metal clad cable clamps designed for the particular channel that is used.
- I. Cable preparation for installation of fittings shall follow manufacturer's instructions. The manufacturer's specialized tools shall be used for preparing cable ends for installation of fittings.
- J. The cable end shall be cut square to ensure flush seating of the cable into the fitting. Fitting securement screws shall be properly torqued. Cable ends shall be fitted with insulating bushings intended for the type of metal clad cable being installed.
- K. For jacketed metal clad cable, the outer jacket shall be removed to the length specified by the fitting manufacturer's instructions. Remove oils or solvent by-products from the outer jacket of the cable. The cable end shall be cut square to ensure flush seating of the cable into the fitting. The fitting gland nut shall be properly torqued to the manufacturer's specifications.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
1. Hangers and supports for electrical equipment and systems.
 2. Construction requirements for concrete bases.

1.02 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.03 QUALITY ASSURANCE

- A. Comply with NFPA 70.

1.04 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.

- f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
- 2. Painted Coatings: Manufacturer standard painted coating applied according to MFMA-4.
 - 3. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
 - C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
 - D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
 - E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - 5. Toggle Bolts: All-steel springhead type.
 - 6. Hanger Rods: Threaded steel.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 5 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with single-bolt conduit clamps.

3.02 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To New Concrete: Bolt to concrete inserts.
 - 2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 3. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 .
 - 4. To Light Steel: Sheet metal screws.
 - 5. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 5 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.04 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.05 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.02 SUBMITTALS REQUIRED

Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

PART 2 - PRODUCTS

2.01 METAL CONDUITS, TUBING, AND FITTINGS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Tube & Conduit.
2. Electri-Flex Company.
3. O-Z/Gedney.
4. Republic Conduit.
5. Thomas & Betts Corporation.
6. Western Tube and Conduit Corporation.
7. Wheatland Tube Company.

Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

GRC: Comply with ANSI C80.1 and UL 6.

EMT: Comply with ANSI C80.3 and UL 797.

FMC: Comply with UL 1; zinc-coated steel.

LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

8. Fittings for EMT, FMC and LFMC:

- a. Material: Steel.
- b. Type: Provide compression type for two inches (2") and smaller, steel set-screw type for conduits two and half inches (2 ½") and larger.

9. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CANTEX Inc.
2. Condux International, Inc.
3. Electri-Flex Company.
4. Heritage Plastics
5. Kraloy.
6. Lamson & Sessions; Carlon Electrical Products.
7. RACO; Hubbell.

Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Mono-Systems, Inc.
4. Square D.

Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

5. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

Wireway Covers: Screw-cover type unless otherwise indicated.

Finish: Manufacturer's standard enamel finish.

2.04 BOXES, ENCLOSURES, AND CABINETS

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. EGS/Appleton Electric.
2. Erickson Electrical Equipment Company.
3. FSR Inc.
4. Hoffman.
5. Hubbell Incorporated.
6. Kraloy.
7. Milbank Manufacturing Co.
8. Mono-Systems, Inc.

9. O-Z/Gedney.
10. RACO; Hubbell.
11. Robroy Industries.
12. Thomas & Betts Corporation.
13. Wiremold / Legrand.

General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1. All boxes shall be labeled to identify circuits numbers and designations, or low-voltage systems use.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover. All boxes shall be labeled to identify circuit's numbers and designations, or low-voltage systems use.
- I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
- K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 or Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.
 14. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 15. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- L. Cabinets:
 1. NEMA 250, Type 1 or Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge.
 3. Key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.
 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC, EMT, RNC, Type EPC-40-PVC.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

Indoors: Apply raceway products as specified below unless otherwise indicated:

6. Exposed, Not Subject to Physical Damage: EMT.
7. Exposed, Not Subject to Severe Physical Damage: EMT.
8. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
 - a. Gymnasiums.
9. Concealed in Ceilings and Interior Walls and Partitions: EMT, Type EPC-40-PVC turned up concealed to a maximum height of 48" AFF.
10. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
11. Damp or Wet Locations: GRC.
12. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

Minimum Raceway Size: 1/2-inch trade size.

Raceway Fittings: Compatible with raceways and suitable for use and location.

13. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
14. EMT: Use setscrew or compression, steel fittings. Steel compression type for two inches (2") and smaller, steel set-screw type for conduits two and half inches (2 1/2") and larger Comply with NEMA FB 2.10.
15. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

Install surface raceways only where indicated on Drawings.

Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F

3.02 INSTALLATION

Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

Each surface lighting fixture, receptacle and switch shall be provided with flush mounted outlet box. All outlets installed in panels and other architectural features shall be centered. The location of any outlet may be moved as much as 10'-0" by the Architect before the outlet is placed without incurring any extra cost. All dimensions refer to the finished floor line. Outlet boxes shall be pressed sheet steel and shall be galvanized for all concealed work. Where conduit runs are exposed outlets shall be of the cast metal type.

Boxes shall be for the service and the type of outlet and shall not be less than 4" square and 1-1/2" deep except where otherwise specified. Boxes installed in walls shall be provided with a square cornered 1-1/2" plaster ring installed flush with surface of wall. Coordinate depth of plaster ring required for particular wall construction. Each outlet box above ceiling shall be supported from a structural member of the building either directly or by using a substantial and approved metal support. Conduit is not an approved means of support. Boxes installed in wall shall be supported either directly to a stud or between studs utilizing an approved bar hanger. In no case shall switch box support and clips used for mounting boxes in old work be used unless specifically called for. Top of outlet box shall be level.

All ceiling or wall recessed outlet boxes or their associated plaster rings shall be flush with the finished surface. Using coverplate to secure wiring devices or shimming the device is not acceptable. Contractor shall exercise due care when cutting opening in walls or ceilings for outlet boxes so that opening size will permit the proper installation of boxes and devices. Fixture studs in ceilings and bracket outlets shall be bolted with stove bolts or shall be locking type of stud mounting.

In addition to boxes indicated, install enough boxes to prevent damage to cables and wires during pulling-in operations.

Remove only knockouts as required and plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.

"There shall be no outlets installed back to back. A minimum of 4" shall separate each outlet."

Where the volume allowed per conductor exceeds that allowed in Table 370-6(b) of the NEC for the minimum size outlet specified, a larger size outlet box shall be used and shall be sized in accordance with the table noted above.

Outlet boxes shall be clean and free from dust, paint, dirt, plaster ready mix joint compound and /or any other debris.

Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

Complete raceway installation before starting conductor installation.

Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for hangers and supports.

Arrange stub-ups so curved portions of bends are not visible above finished slab.

Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

Support conduit within 12 inches of enclosures to which attached.

Stub-ups to Above Recessed Ceilings:

1. Use EMT or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

Surface Raceways:

3. Install surface raceway with a minimum 2-inch radius control at bend points.
4. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

5. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
6. Where an underground service raceway enters a building or structure.
7. Where otherwise required by NFPA 70.

Comply with manufacturer's written instructions for solvent welding RNC and fittings.

Expansion-Joint Fittings:

8. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 degF and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 degF and that has straight-run length that exceeds 100 feet.
9. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
10. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degF of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per degF of temperature change for metal conduits.

Install expansion fittings at all locations where conduits cross building or structure expansion joints. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

11. Use LFMC in damp or wet locations subject to severe physical damage.
12. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Locate boxes so that cover or plate will not span different building finishes.

Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

Set metal floor boxes level and flush with finished floor surface. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.03 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 0544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.04 FIRESTOPPING

Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 8413 "Penetration Firestopping."

3.05 PROTECTION

Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 05 44 - SLEEVES FOR RACEWAYS AND CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Grout.

B. Related Requirements:

1. Division 7 Section "Through-Penetration Firestop Systems" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

PART 2 - PRODUCTS

2.01 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.02 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

- C. Design Mix: 5000-psi, 28-day compressive strength.

- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.01 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Warning labels and signs.
5. Equipment identification labels.

1.02 SUBMITTALS REQUIRED

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.03 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.04 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.02 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2.03 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a black background. Minimum letter height shall be 3/8 inch

2.04 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F.
 - 5. Color: Black.

2.05 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 9 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.
- G. Painted Identification: Comply with requirements in Division 9 painting Sections for surface preparation and paint application.

3.02 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Cables within Buildings: Identify the covers of all junction and pull boxes of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. Junction boxes containing line voltage wiring shall include panel and circuit designation (ex. HA - 1,3,5 or LA - 2,4,6).
- B. System legends shall be as follows:
 - 1. Fire Alarm System
- C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
1. Limit use of underground-line warning tape to direct-buried cables.
 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
1. Comply with 29 CFR 1910.145.
 2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.
 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- G. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch high letters for emergency instructions at equipment used for power transfer.
- H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 2. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
 - d. Enclosed switches.
 - e. Enclosed circuit breakers.
 - f. Junction boxes

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 22 00 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:
 - 1. Distribution transformers.

1.02 SUBMITTALS REQUIRED

- A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

1.03 QUALITY ASSURANCE

- A. Source Limitations: Obtain each transformer type through one source from a single manufacturer.
- 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 IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.05 COORDINATION

- A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.
- B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Products.
 2. General Electric Company.
 3. Siemens Energy & Automation, Inc.
 4. Square D; Schneider Electric.

2.02 GENERAL TRANSFORMER REQUIREMENTS

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
- B. Cores: Grain-oriented, non-aging silicon steel.
- C. Coils: Continuous windings without splices except for taps.
1. Internal Coil Connections: Brazed or pressure type.
 2. Coil Material: Aluminum.
- D. Voltage: Primary rating shall be 480 volts, 3 phase. Secondary rating shall be 120/208V, 3 phase grounded wye.
- E. KVA ratings shall be as shown on the drawings.

2.03 DISTRIBUTION TRANSFORMERS

- A. Comply with NEMA ST 20 and list and label as complying with UL 1561.
- B. Cores: One leg per phase.
- C. Interior Enclosures: Ventilated, NEMA 250, Type 2.
1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
- D. Exterior Enclosures: Ventilated, NEMA 250, Type 3R.
1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
- E. Transformer Enclosure Finish: Comply with NEMA 250.
1. Finish Color: Gray.
- F. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.
- G. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

- H. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.
- I. Energy Efficiency for Transformers Rated 15 kVA and Larger:
 - 1. Complying with NEMA TP 1, Class 1 efficiency levels.
 - 2. Tested according to NEMA TP 2.
- J. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.
 - 1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
 - 2. Indicate value of K-factor on transformer nameplate.

2.04 IDENTIFICATION DEVICES

- A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section "Electrical Identification."

2.05 SOURCE QUALITY CONTROL

- A. Test and inspect transformers according to IEEE C57.12.91.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.
- B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.
- C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.
- D. Verify that ground connections are in place and requirements in Division 26 Section "Grounding and Bonding" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Floor mounted transformers: Install transformers on concrete bases, 4-inch nominal thickness. Comply with requirements for concrete base specified in Division 3 Section.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
2. For transformers, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor. Provide isolation pads (to mitigate vibration noise) between concrete pad and transformer base.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts required for proper attachment to transformer.

3.03 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding."
- B. Connect wiring according to Division 26 Section "Conductors and Cables."

3.04 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. Remove and replace units that do not pass tests or inspections and retest as specified above.

3.05 ADJUSTING

- A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.
- B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.06 CLEANING

- A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles and associated device plates.
 - 2. Toggle switches.
- B. Related Sections include the following:
 - 1. Division 27 Section "Data Voice Cabling" for workstation outlets.

1.02 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 2. Cord and Plug Sets: Match equipment requirements.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.05 CLOSEOUT DOCUMENTS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.06 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- 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 NFPA 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).
 - 5. Acuity Controls

2.02 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.

2.03 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, Specification Grade, Tamper Resistant, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper: TR5362
 - b. Hubbell: 5352TR
 - c. Leviton: 5352TR
 - d. Pass & Seymour: 5362TR

2.04 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

- 1) Single Pole:
 - a) Cooper: CSB120
 - b) Hubbell: CSB120
 - c) Leviton: CSB1-20
 - d) Pass & Seymour: CSB20AC1.
- 2) Two Pole:
 - a) Cooper: CSB220
 - b) Hubbell: CSB220
 - c) Leviton: CSB2-20
 - d) Pass & Seymour; CSB20AC2.
- 3) Three Way:
 - a) Cooper: CSB320
 - b) Hubbell: CSB320
 - c) Leviton: CSB3-20
 - d) Pass & Seymour; CSB20AC3.
- 4) Four Way:
 - a) Cooper: CSB420
 - b) Hubbell: CSB420
 - c) Leviton: CSB4-20
 - d) Pass & Seymour; CSB20AC4.

C. Pilot Light Switches, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Cooper; AH1221PL for 120 and 277 V.
- b. Hubbell; HBL1201PL for 120 and 277 V.
- c. Leviton: 1221-PLR.
- d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

D. Key-Operated Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Cooper; AH1221L.
- b. Hubbell; HBL1221L.
- c. Leviton; 1221-2L.
- d. Pass & Seymour; PS20AC1-L.

2. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Cooper; 1995.
- b. Hubbell; HBL1557.
- c. Leviton; 1257.
- d. Pass & Seymour; 1251.

F. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Cooper; 1995L.
- b. Hubbell; HBL1557L.
- c. Leviton; 1257L.
- d. Pass & Seymour; 1251L.

2.05 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

- 1. Plate-Securing Screws: Metal with head color to match plate finish.
- 2. Material for Finished Spaces: 0.035 inch-thick, over-sized "jumbo" satin finished stainless steel.
- 3. Material for Unfinished Spaces: 0.035 inch-thick, over-sized "jumbo" satin finished stainless steel.
- 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.

2.06 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

- 1. Wiring Devices Connected to Normal Power System: Gray, unless otherwise indicated or required by NFPA 70 or device listing. Provide brown devices shown on stained wood surfaces. Coordinate with Architectural surface finish infrastructure.
- 2. Wiring Devices Connected to Emergency Power System: Red

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise

noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. Use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Use oversized or jumbo plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical

and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

3.02 IDENTIFICATION

A. Comply with Division 26 Section "Electrical Identification."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.03 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 51 16 - INTERIOR LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior luminaires, LED module, and drivers.
2. Luminaire supports.

1.02 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. IP: International Protection or Ingress Protection Rating
- D. Lumen: Measured output of lamp and luminaire, or both.
- E. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.03 SUBMITTALS REQUIRED

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
5. Include photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the luminaire as applied in this Project.

B. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

C. Sample warranty.

1.04 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in maintenance manuals.
 - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.05 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory is accredited under the NVLAP for Energy Efficient Lighting Products.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.07 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
 - 1. LED Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 GENERAL LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. UL Compliance: Comply with UL 1598.
- D. Nominal Operating Voltage: see drawings.
- E. Recessed Luminaires: Comply with NEMA LE 4.

2.02 LED LUMINARIES

- A. CRI of minimum 80.
- B. Rated lamp life of 50,000 hours.
- C. Lamps dimmable from 100 percent to 10 percent of maximum light output, unless otherwise noted.

- D. Internal driver. Provide with standard 0-10V dimming.

2.03 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.

C. Diffusers and Globes:

1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

- D. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI for all luminaires.

2.04 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.05 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish shall match luminaire.
- C. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 TEMPORARY LIGHTING

- A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.03 INSTALLATION

- A. Comply with NECA 1.
- B. Remote Mounting of Drivers: Distance between the driver and luminaire shall not exceed that recommended by driver manufacturer. Verify, with driver manufacturers, maximum distance between driver and luminaire.
- C. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- D. Coordinate layout and installation of luminaires and suspension system with other construction that penetrates ceilings or is supported by them.
- E. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- F. Ceiling-Grid-Mounted Luminaire Supports: Use grid as a support element.

1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each luminaire. Locate not more than 6 inches from luminaire corners. Provide a minimum of two wires on opposite corners of fixture
2. Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner with clips that are UL listed for the application.
3. Luminaires of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

G. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

H. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

I. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables" and Section 26 0533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.04 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.05 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
- B. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to emergency power and retransfer to normal.
- C. Luminaire will be considered defective if it does not pass operation tests and inspections.
- D. Prepare test and inspection reports.

3.06 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 27 01 40 - FIRE ALARM SYSTEM

1.01 SUBMITTALS

- A. Shop drawings shall be submitted as follows:
1. Manufacturer's published literature.
 2. One line schematic diagram covering the complete building system.

1.02 MANUFACTURERS

- A. Acceptable manufacturers are:
1. Notifier
 2. Honeywell
 3. Johnson Controls
- B. The acceptable manufacturers systems listed in 1.02 A, shall be installed by the authorized local factory dealer/representative for that product. The factory dealer representative shall hold a current low voltage contractor's license.

Any interested parties shall submit a company resume showing years in business, certification stating that he is an authorized representative for the manufacturer of the equipment he is submitting for approval and that he maintains a fully equipped and stocked service shop and shall respond to service calls within 12 normal working hours, list of key personnel, copies of appropriate licenses and list of recently completed jobs during the normal prior approval period.

1.03 SCOPE

- A. This specification covers the installation of a complete electronically operated fire alarm system. The system within the building shall be electrically supervised and shall include, but not be limited to, the following components:
1. Manual non-code type alarm boxes, combination vibrating horns and flashing light, control equipment, duct smoke detectors, conduit, and wiring.

1.04 GENERAL REQUIREMENTS

- A. The alarm equipment and all wiring shall be installed and interconnected by a factory certified installer and placed in working order. The name of the manufacturer and serial or identification numbers shall appear on all major components. Electrical supervision of the system shall conform to provisions of Article 240. NFPA Standard 72. Corresponding parts of all similar type equipment units shall be interchangeable, and locks for all cabinets shall be keyed alike. All devices, equipment and combination thereof shall be of the manufacturer's current production. All component parts of the system and the control unit shall be approved for the purpose intended. The stamp, label,

seal or certificate of the Underwriter's Laboratories or the Factory Mutual Laboratories shall be considered as acceptable evidence of such approval.

- B. Fire Alarm Subcontractor shall submit a certification stating that he is an authorized representative for the manufacturer of the equipment he is submitting for approval and that he maintains a fully equipped and stocked service shop and shall respond to service within 12 normal working hours.
- C. Contractor shall include in base bid factoring training and certification of two employees of the Owner. Any electronic equipment such as laptops, etc., required to program system shall be provided.
- D. Contractor shall include in base bid all necessary components at fire alarm control panel to provide for 20% spare capacity for future portables.

1.05 DRAWINGS AND MANUALS

- A. Three copies of complete instructions for the operation, inspection, testing and maintenance of the system, including wiring diagrams and replacement parts list shall be furnished upon final acceptance of the system. Also provide all special tools that are necessary for the maintenance of the equipment and include one set of fuses for each type and size.

1.06 INSTALLATION

- A. A qualified fire alarm technician shall install, adjust and test the equipment. The technician shall be qualified by training and experience in the installation and operation of the fire alarm system specified. The technician shall instruct operating personnel in the operation, adjustment and maintenance of the system. A statement signed by the person or persons instructed shall be supplied to the Architect prior to final operation.
- B. Provide a written certification that the system is in complete and proper working order and in compliance with all codes.

1.07 SYSTEM OPERATION

- A. Operation of any manual or automatic initiating device shall cause a general alarm to sound.
- B. Also circuits and audible sounding devices shall be electrically supervised. In the event of an open circuit or ground in the system, loss of operation of supervisory power, or other supervised component failure, a trouble signal shall be actuated until the system is restored to normal. A silencing switch shall be provided for silencing the trouble alarm.
- C. The system shall operate from one 120 volt circuit.
- D. Fire Alarm System shall be interlocked with range hood extinguishing system, such that when system is activated, general alarm is sounded and signal is sent to the annunciator. Provide control module to activate shunt trip breaker serving cooking equipment beneath hood.

1.08 SYSTEM COMPONENTS

- A. Fire alarm control panels: Connect to existing Notifier panel.

- B. Fire alarm subcontractor shall determine the load based on the fire alarm device layout and provide additional power supply modules as required. Coordinate with Division 26 120 volt circuit for power supply. Label panelboard schedules accordingly.
- C. Signal device: Provide combination low power D.C. speaker/strobe with high intensity flashing strobe light for both audible (voice evacuation) and visual signaling or strobe light for visual signalling only. Minimum sound level indoors at 10 feet shall be 90 db. Maximum current draw for horn and strobe light of 0.063 amps, nominal voltage of 24 D.C. Units shall be flush wall mounted 6'-10" above the finished floor at points noted on the drawings. Minimum candela level shall be 75 candela. Candela level for areas under 300 square feet may be 15. All strobes in a common area shall be synchronized. Where signaling devices are located in a Gymnasium or area susceptible to damage, Contractor shall provide a wireguard.
- D. Smoke detectors shall be furnished, installed and connected under Division 26. Power supply for detectors shall be 24 volt D.C. and supplied from Fire Alarm control panel. Detectors shall be photo electric type. Each detector shall have flashing LED for operational walk check.
- E. Smoke detectors in duct work shall be photo electric type furnished and connected under Division 27, installation in duct work shall be accomplished under Division 23. Power supply for detectors shall be 24 volts D.C. and supplied from fire alarm control panel. Provide contacts to automatically shut down fan motors. Sampling tubes shall extend across the entire width of the duct. Provide remote station at readily accessible location in mechanical room, or if air handling unit is above ceiling, mount remote station in wall below ceiling, having LED to indicate alarm condition and key switch to test and reset alarm relay. Mount remote station 6'-0" above finished floor. Detectors for air handling equipment rated over 2000 CFM, but under 15,000 CFM shall be located in the supply duct. Detectors for air handling equipment rated over 15,000 CFM shall be located in the supply and return ducts. Detectors shall be provided whether called for on the plans or not. Look up code section and reference. Location of detectors in duct work shall be as recommended by detector manufacturer, but in no case shall detector be located ahead of filters. Location of duct detectors shown are schematic in nature only. Verify exact location with unit and duct work placement. Where duct detector is required to be on building exterior, provide weatherproof detector.
- F. Tamper switches and flow switches shall be provided and installed under Division 15 of these specifications, and connected under Division 26. Power supply shall be 24 volts D.C., supplied from the fire alarm control panel.
- J. Carbon Monoxide detectors, where called for, shall be provided, installed and connected under Division 27. Detectors shall be intelligent, addressable and meet UL 2075 standard for system-connected life safety carbon monoxide detection. Detector shall be sleek, low profile design, with 10-year CO cell with end-of-life warning. Realtest CO Testing Capability.
- G. Each fire alarm circuit shall be protected from lightning by installing surge protection devices either internally or externally. Circuits run between buildings shall be individually protected in addition to protection at control panel.

- H. All conductors (by Division 27) shall be installed in conduit furnished by Division 26. Conduit installation shall be carefully coordinated with Division 26. All fire alarm conduit, J-boxes and covers shall be red.
- I. Number and size of conductors shall be as required by manufacturer of system being installed. Any cable run in conduit below grade shall be moisture proof, cable shall be equal to West Penn Aqua seal.
- J. At time of final inspection, Contractor shall turn over a red-lined set of plans showing device location, device address, and device descriptor. Panel shall be fully programmed to denote location of addressable device. Provide a written report denoting that all fire alarm devices have been tested and are operable.
- K. Where a post indicator valve for fire sprinkler system is provided, Contractor shall provide a fire alarm system connection to tamper switch. Connection to such shall be waterproof. Provide lightning/surge protection devices at conductors serving such. Refer to civil plan for exact location of post indicator valve.
- L. Provide lightning arrestor surge protection modules for all cabling routed from fire alarm control.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 27 02 00 - IP INTERCOM AND CLOCK SYSTEM

1.01 GENERAL REQUIREMENTS

- A. The conditions of the General Contract (General, Supplementary, and other Conditions) and the General Requirements are hereby made a part of this Section.
- B. All bids shall be based on the equipment as specified herein. The catalog numbers and model designations are that of the Bogen Nyquist E7000 Series Educational System. The specifying authority must approve any alternative system.
- C. Contractors who wish to submit alternative equipment shall provide the specifying authority with the appropriate documentation at least 15 business days prior to bid opening. The submitted documentation must provide a feature by feature comparison identifying how the proposed equipment meets the operation and functionality of the system described in this specification. Prior to bid date, the contractor shall provide adequate and complete submittal information, which shall include but not be limited to specification sheets, working drawings, shop drawings, and system demonstration. The alternative supplier-contractor must also provide a list to include six installations identical to the proposed system.
- D. The contractor shall provide the FCC registration number of the proposed system, where applicable.
- E. Final approval of the alternative system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternative system at the contractor's expense.
- F. The contractor for this work shall have read all the bidding requirements, the general requirements of division 26, and the contract proposal forms, and shall be held to the execution of this work. The contractor shall be bound by all the conditions and requirements therein.
- G. The contractor shall be responsible for providing a complete functional system, including all necessary components whether included in this specification or not.
- H. In preparing the bid, the contractor should consider that no claim will be made against the owner for any costs incurred by the contractor for any equipment demonstrations requested by the owner.

1.02 SCOPE OF WORK

The contractor shall furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating VoIP school communications system including but not limited to:

- A. Nyquist NQ-E7030 Analog Station Bridge (ASB)
 - 1. 24 station interface supporting analog speakers and call switches
 - 2. Built-in 2x120W power amplifiers
 - 3. Two speech links
 - 4. Category wiring
 - 5. 25/70-volt speaker(s), ceiling-mounted, wall-mounted, and paging horns
 - a. Ceiling Mounted Acoustical Tile Speakers: CSD2X2U Drop-In Ceiling Speaker
 - b. Ceiling Mounted Gypboard Speakers: S810T725PG8U Ceiling Speaker
 - c. Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker
 - 6. Analog/Mechanical Call Switches capable of placing Normal, Urgent, or Emergency priority calls

- a. CA-15C rocker style momentary call button
 - b. CA-21B rocker style momentary call button with a push on position for privacy
7. CAN Bus 2.0 interface designed for future support of Nyquist Digital Call Switch (DCS) NQ-E7020 that can initiate Normal, Urgent, or Emergency priority calls, all with options for Privacy Mode
- B. Nyquist NQ-P0100 Matrix Mixer Pre-Amplifier (MMPA)
1. Four Mic/Line inputs that are user-configurable
 2. Line-Level/Monitor output
 3. Digital AES/EBU (AES3) input
- C. Nyquist NQ-E7010 Input/Output (I/O) Controller
1. Eight inputs to monitor third-party device events
 2. Eight outputs to initiate third-party device actions
 3. Power over Ethernet (PoE) Class-1 (IEEE 802.3af compliant)
- D. Speakers, 25/70-volt, ceiling-mounted, wall-mounted, and paging horns
1. Ceiling Mounted Acoustical Tile Speakers: CSD2X2U Drop-In Ceiling Speaker
 2. Ceiling Mounted Gypboard Speakers: S810T725PG8U Ceiling Speaker
 3. Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker
- E. Nyquist E7000 Series Educational System Software. Program software to include all new devices.
1. Web Server for full system configuration and operation
 2. Nyquist web-based Administrative User Interface (Admin Web UI) for programming and day-to-day system operation, including but not limited to:
 - a. Station intercom two-way calling
 - b. Zone Paging with software-adjustable volume per zone
 - c. Emergency Paging
 - d. Playing Emergency Tones
 - e. Playing Tones
 - f. Playing Announcement Files
 - g. Managing Bell Schedules
 - h. Weekly Bell Schedule Review at-a-glance
 - i. Audio Distribution
 - j. System muting
- F. Teacher's Dashboard web-based UI for teachers, including but not limited to:
1. Directory
 2. Dial Pad
 3. Voicemail
 4. Call Forwarding
 5. Single-click or touch Normal or Emergency calling
 6. Single-click or touch 911 calling
- G. VoIP Admin Phone, PoE, 7" 800 x 480-pixel color touch screen with backlight
- H. VoIP Staff Station, PoE, 132 x 64-pixel graphical LCD with backlight

- I. POE Clocks
- J. Owner Telephone System Connectivity
 - 1. System shall be capable of connecting to the Public Switched Telephone Network (PSTN), analog Public Branch Exchange (PBX), or digital PBX/IP-PBX by connecting to an unlimited number of SIP trunks, analog FXO/FXS lines, or CO Trunks.
 - 2. Telephone service with public utilities will be arranged by the owner in conjunction with the equipment supplier. Equipment supplier shall generate a one-page document that will provide the owner with the number of outside lines.

1.03 SUBMITTALS

- A. Spec Sheets on all items including cable types
- B. Outline drawing of system control cabinet showing relative position of all major components
- C. Shop drawings, detailing integrated electronic communications network system including, but not limited to, the following:
 - 1. Station wiring arrangement
 - 2. Equipment cabinet detail drawing
- D. Wiring diagrams showing typical connections for all equipment
- E. Numbered Certificate of Completion for installation, programming, and service training, which identifies the installing technician(s) as having successfully completed the Nyquist E7000 technical training course provided by the Bogen Communications, Inc.

1.04 QUALITY ASSURANCE

- A. All items of equipment shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.
- B. The contractor shall be an established communications and electronics contractor that maintains a locally run and operated business and has done so for at least 10 years. The contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges.
- C. The contractor shall show satisfactory evidence, upon request, that he or she maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The contractor shall maintain at his or her facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

1.05 SINGLE SOURCE RESPONSIBILITY

- A. Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and a minimum of 30 years of experience in the industry. The supplying contractor shall have attended the manufacturer's installation and service training classes. A certificate of this training shall be provided with the contractor's submittal.

1.06 SAFETY / COMPLIANCE TESTING

The communications system and its components shall, where applicable, bear the label of a Nationally Recognized Testing Laboratory (NRTL), such as Environmental Technology Laboratory (ETL), and shall be listed by their re-examination service. All work must be completed in strict accordance with all applicable electrical codes, under direction of a qualified and factory-approved contractor, and to the approval of the owner.

1.07 IN-SERVICE TRAINING

The contractor shall provide a minimum of eight hours of in-service training with this system. These sessions shall be broken into segments, which will facilitate the training of individuals in the operation of this system. User Guides shall be provided at the time of this training.

1.08 WIRING

- A. System wiring and equipment installation shall be in accordance with generally-accepted engineering best practices as established by the EIA and the NEC. Wiring shall meet all state and local electrical codes. All wiring shall be tested to be free from grounds and shorts.
- B. All system wiring shall be labeled at both ends of the cable. All labeling shall be based on the room numbers as indicated in the architectural graphics package.
- C. Wiring shall be installed per manufacturer's recommendation (Cat 5 or West Penn #357) depending on speaker type. All terminal connections are to be on barrier strips. All wiring not in conduit shall be plenum rated.

1.09 PROTECTION

- A. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.
- B. The contractor shall note on their system drawings, the type and location of these protection devices and all wiring information. Such devices are not to be installed above the ceiling.

1.10 SERVICE AND MAINTENANCE

- A. The contractor shall provide a five-year equipment hardware warranty of the installed system against defects in material and workmanship. All materials shall be provided at no expense to the owner during normal working hours. The warranty period shall begin on 1st of the month following the date of shipment.
- B. The contractor shall, at the owner's request, make available a service contract offering continuing factory authorized service of this system after the initial hardware and software warranty periods.
- C. System shall include software maintenance that includes bug fixes and new feature releases for a period of six years.
- D. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

2.01 MANUFACTURERS

- A. Manufacturers, subject to compliance with requirements specifications, provide the following system:

Bogen Nyquist E7000 Series Educational System manufactured by Bogen Communications, Inc.

- B. The specifying authority must approve any alternative system 15 business days prior to bid day.
- C. The intent is to establish a standard of quality, function, and features. It is the responsibility of the contractor to ensure that the proposed product meets or exceeds every standard set forth in these specifications.
- D. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

2.02 EQUIPMENT

- A. Nyquist NQ-E7030 Analog Station Bridge
 - 1. 24 station support
 - 2. 120W of total available power; max. 40W per any individual port
 - 3. 25 Volt Speakers(s)
 - 4. Analog Call Switch(s)
 - 5. Software programmable configuration and operation
 - 6. Rack mounted, wall mounted, or shelf mounted
 - 7. CAN Bus 2.0 interface for future support for NQ-E7020 DCS
- B. Nyquist NQ-P0100 Matrix Mixer Pre-amplifier
 - 1. No less than four Line/Microphone Level Inputs used for:
 - a. CD Player
 - b. AM/FM Tuner
 - c. Push-to-Talk Paging Microphone
 - d. MP3 Player
 - e. Digital AES/EBU (AES3) input
 - 2. Line Level output to drive external amplifier
 - 3. Software programmable configuration and operation
 - a. Push-to-Talk Channel
 - b. Push-to-Talk Type
 - c. Push-to-Talk Zone
 - d. Mixer Channels
 - 4. Mixer Channels Wall or shelf mounted
- C. Nyquist NQ-E7010 Input/Output Controller
 - 1. Eight Dry Contact Inputs
 - 2. Eight Open Collector Outputs
 - 3. Software programmable configuration and operation including:
 - a. Contact Type
 - b. Extension
 - c. Name
 - d. Close Interval
 - e. Actions including:
 - i. Audio
 - ii. Alarm
 - iii. Announcement
 - iv. Disable-Audio
 - v. Other
 - vi. Tone

- vii. Enable-Audio
 - f. Action ID
 - g. Zones
 - h. Close Extension
 - i. Dashboard Type
 - j. Dashboard Title
 - k. Dashboard Scope
 - l. Dashboard Text
 - m. Dashboard Style
 - n. Email
4. Wall or shelf mounted

D. Nyquist Station Equipment

- 1. CSD2X2U Drop-In Ceiling Speaker
- 2. S810T725PG8U Gypboard Ceiling Speaker
- 3. Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker
- 4. CA15C or CA21B Analog Call Switch

E. Telephone Interface Equipment

- 1. Telephony interface device(s) for FXO/FXS analog port connectivity

2.03 COMPONENTS AND DESCRIPTIONS

The Nyquist E7000 Series Educational System is a software-based VoIP paging and intercom system.

The Nyquist E7000 Series Educational System must be capable of supporting existing Bogen Multicom 2000 and Bogen Quantum Multicom IP wiring, 25-volt speakers and analog call-switches, and equivalent competitive systems utilizing the existing architectural numbering scheme. The VoIP capabilities of the Nyquist system will enable the support of the features across the various Nyquist appliances within the facility. The following sections define how the system handles each of the features in the system. Systems that do not allow the reuse of existing wiring or numbering scheme shall not be deemed acceptable. Systems that do not allow appliances to be seamlessly integrated via the LAN are not considered equal.

A. Nyquist E7000 Server Software

- 1. The Nyquist E7000 server software shall be installed on a RCSS supplied server. An unlimited number of facilities can be networked into a Nyquist-based District.
- 2. Audio shall be transmitted between the server and the Nyquist appliances using the customer supplied LAN/WAN using both G.722 and Opus 48k audio encoding and streaming technology to deliver High Definition audio quality. Systems that do not use G.722 and Opus for audio encoding and streaming shall not be deemed equivalent.
- 3. The Nyquist server software and Nyquist appliances software shall be upgradeable via the Nyquist Web UI.
- 4. It shall be possible for a Nyquist facility to make “station-to-station” calls and “remote facility” All-Call pages to a single facility or to all Nyquist facilities in a district via the Nyquist Web UI or an Admin Station. Systems that require remote viewing software or other application software to be installed/loaded on to additional servers or PCs to make station-to-station calls and remote facility All-Call or district paging shall not be considered equivalent.

5. The Nyquist server software is designed to handle all facility and district-wide communications, including but not limited to, inter-facility intercom calling and paging, district-wide Emergency All-Call and local facility point-to-point calls. Via the Nyquist Web UI, every facility shall be configured with the IP addresses of all the other remote facilities within the district.
6. Nyquist can support an unlimited number of facilities; however, the maximum number of simultaneous remote facility intercom calls supported is based on the actual performance of the WAN and the Nyquist Server CPU load.
7. The voice quality of the facility calls may vary based on the WAN conditions. The maximum network bandwidth that All-Call and Zone Paging uses is 64 kbps (Multicast G.722), and intercom calls use 128 kbps (unicast, G.722).
8. The system shall facilitate the repetitive playing of Normal or Emergency audio tones or announcements directed to a Paging Zone until stopped by the Nyquist user via the Web UI, an Admin Station, or a dry contact closure connected to the Nyquist I/O Controller NQ-E7010.
9. A built-in Master Clock shall be included to automatically control class change bells or other time-based signals. The Master Clock shall have an unlimited number of Events that may be programmed into any of the unlimited number of Schedules, and unlimited number of Holidays. The schedules shall be nameable for easy selection when assigning schedules to days or overriding a schedule.
10. Network Time Synchronization. The system shall be capable of periodically updating/synchronizing the processor's time with a Network Time Server running Network Time Protocol (NTP) via the school's LAN network. Systems that do not provide Network Time Synchronization will not be deemed equivalent. The Nyquist server can be the NTP server for other devices on the LAN such as IP clocks and other IP devices.

B. Nyquist Server Application

1. The Nyquist software is installed onto the RCSS server, and upon boot-up, users can log in to the Nyquist server application via a web browser that supports WebRTC. Systems that require Com Port redirect software, client PC application, software or serial-to-Ethernet adapters for user access are not deemed equal. Communications between the server and the Web UI(s) shall be via secure Hyper Text Transfer Protocol (HTTPS) connections (i.e., https://).
2. The Nyquist Web UI shall be configured with four different default user access levels, based on four unique user roles. Systems that do not provide unlimited access levels and unlimited user roles are not considered equal.
 - a. The four default roles shall be: admin, optech, operator, and user. These roles provide a starting point/example for administrators to create additional roles.
3. Only a user assigned the admin role shall be able to provide access to users, giving them the ability to create, delete, edit, and view system parameters.
4. Only an Administrator shall have the ability to adjust roles and Class of Service (CoS) of users. The roles determine if users can view the definable data objects that can include configuration, alarms, and performance data and if users can perform certain operations based on the user's role and station's CoS. All changes to roles and CoS are effective immediately, without the need to restart the browser or reboot the server.
5. The Nyquist Web UI Dashboard shall provide full administrative capabilities to manage/operate the following system features:

- a. Calling/Paging – User can initiate a call by accessing the directory or by dial pad and can receive calls, make Zone Page and All-Call Page, make a Prepending Page, Emergency All-Call paging.
- b. Call Forwarding
- c. District Calling/Paging – Used for District Facility Page, District All-Call, and District Emergency All-Call.
- d. Tones/Announcements – Used to play Tones, Announcements, and Alarms.
- e. View This Week’s Schedule – Used to show the current interactive Bell Schedule.
- f. Audio Distribution – Used for entire facility or Audio Zones
- g. Enable or Disable Audio – Used to place the Nyquist system into Page Exclusion mode (i.e., ”mute” the system) when a contact closure is supplied from the fire alarm panel. Systems that do not provide this capability are deemed not equal.

Systems that require application software to be installed on a PC to manage the above features shall not be considered equivalent.

6. To facilitate installation and configuration of the system, additional Web UI menus are required. The menus shall only be visible to users with the correct roles and CoS. The navigation menus found on the Web UI shall be as follows:
 - a. System Parameters – Allow installers to adjust core system parameters.
 - b. Zones – Allow installers to create and modify Paging, Time, and Audio Zones.
 - c. Schedules – Allow installers and administrators to create bell schedules for the facility, predefine alternative schedules to run, prevent the bells from ringing on a holiday, and schedule an announcement to play. The system shall allow an unlimited number of schedules to operate simultaneously within a facility.
 - d. Admin Groups – Allow the installer to create, modify, and delete software groupings of admin phones that can ring when a station calls in with a call switch.
 - e. CoS Configuration – Allow the installer to create, modify, and delete CoS groups that control station access to the following features: Call-in Level, Zone Paging, All-Call Paging, Emergency All-Call, Inter-Facility Call/Page, Audio Distribution, Remote Pickup, Join Conversation, Call Forwarding, Walking Class of Service, External Call Routing, Call Transfer/3-way Calling, Manually Activate Tone Signals, Call Any Station, Manage Recording, Monitor Calls, Monitor Locations, Conference Admin, Conference User, Voicemail, Record Calls, Activate Alarm Signals, Disable Audio, Enable Audio, Allow Callee Auto-answer, District Paging, and Inter-Facility Features.
 - f. Stations – Allow the installer to set up, modify, and delete stations; set up Page Exclusion; view Station Status; and add New Stations.
 - g. Bridge Devices – Allow the installer to configure the Nyquist ASBs.
 - h. Audio – Allow the installer to upload and manage Announcements, Playlists, Songs, and Tones. The system must support the uploading of both MP3 and WAV files and make Audio file management simple for users. Systems that limit the size of Audio files shall not be considered equal.
 - i. Users – Allow the installer to manage users by giving them the proper roles and assign extensions if needed.
 - j. Roles – Allow the installer to grant users rights to Create, Delete, Edit, Restart Server, Sort Menu, Systems Update, Manage, Import/Export, Restore, Settings, or View.
 - k. Facilities – Allow the installer to set up the district wide facilities for remote paging and calling.
 - l. Outside Lines – Allow the installer to set up FXS and FXO ports for inbound and outbound system calling.
 - m. SIP Trunks – Allow the installer to set up SIP trunks into the facility for inbound or outbound calling.
 - n. Call Details – Allow the installer to review the historical system activities that can be used for incident investigation or system troubleshooting.
 - o. System Backup/Restore – Allow the installer to preform system backups or restores and allow the backups to be schedule to run automatically.
 - p. System Logs – Allow the installer to view and export Server, Nyquist-Intercom, and Web Server logs that can be used for troubleshooting and technical assistance.
 - q. Paging Exclusions – Allow the installer to view and edit stations that are excluded from paging.

- r. Firmware – Update firmware for Nyquist speakers and appliances.
- s. Help – Provide information about the system, online help topics, and System Administrator Manual.

Systems that do not provide these menus as a minimum shall not be considered equal.

C. Nyquist NQ-E7030 Analog Station Bridge

1. The Nyquist NQ-E7030 ASB allows facilities with existing Multicom or Quantum or compatible intercom systems to upgrade to Nyquist. Each ASB supports up to 24 speakers and call switches with 120 Watts of embedded 25 Volt power. The ASB is designed to drive any combination of 25 Volt speakers and horns. Features Include:
 - a. 10/100 Ethernet
 - b. 24 station interface - Supports connections to as many as 24 individual 25 Volt speakers with one 25 Volt speaker connection per interface
 - c. 24 dry contact closure-type analog Call Switch connections
 - d. Half-duplex talkback using speaker as pickup
 - e. CAN Bus 2.0 Interface for future NQ-E7020 DCS support and other accessory devices
 - f. 120W of available power across all 24 channels; maximum 40W per channel
 - g. 2 x RGB full spectrum LED status indicators
 - h. USB 2.0 host port, type A connector (future use)
 - i. Universal mains supply (100VAC – 240VAC)
2. The Nyquist NQ-E7030 ASB shall be rack, wall, or shelf mountable and shall include the required mounting bracket hardware.

D. Nyquist NQ-P0100 Matrix Mixer Pre-Amplifier (MMPA)

1. The Nyquist NQ-P0100 MMPA is designed to bring external audio into the Nyquist system. The MMPA interfaces with a local sound system by accepting one or more local audio sources, mixing them, and outputting them to either, a) the network for Audio Distribution, or b) the MMPA's line level output that can then be inserted into an external amplifier to drive local sound system in gyms, cafeterias, auditoriums, etc. The MMPA supports the following:
 - a. Four software selectable MIC or Line Input channels via three XLR connectors and four sets of screw-terminals. Any single input channel shall be capable of being configured to support a Push-to-Talk microphone (for example, Bogen DDU-250). Channel-1 can be configured as a digital AES/EBU (AES3) input. Line/Monitor output – The MMPA becomes a station on the Nyquist system, allowing users to call it directly or to include it in any of the Page, Time, or Audio Zones.
 - b. The MMPA shall support the following features: Line-Level output to drive input on a local amplifier; One USB 2.0 host port (Type-A connector) for future use; 2 x RGB full spectrum LED status indicators.
 - c. The MMPA is powered by Universal mains supply (100VAC – 240VAC).
 - d. The MMPA shall be wall or shelf mountable and shall include the required mounting bracket hardware.
2. The dealer shall supply a minimum of one Nyquist MMPA that allows for up to four user-configurable audio inputs. The MMPA shall support Line, MIC, and digital AES/EBU (AES3) input sources. The system shall support an unlimited number of MMPAs.

E. Nyquist NQ-E7010 Input/Output Controller

1. The Nyquist NQ-E7010 I/O Controller is designed to accept contact closure inputs and activate open-collector outputs to drive relay coils.
 - a. PoE Class-1; IEEE 802.3af compliant with Optional 48VDC 15W power supply
 - b. Eight Dry Contact Closure Inputs that can be used with Fire Alarm Override Relays, external event triggers (for example, Lockdown Buttons, etc.)
 - c. Eight Relay Driver Outputs (Open-Collector) for use with Clock Correction (Sync Pulse), response to contact closure inputs, etc.
 - d. USB 2.0 host port, Type-A connector (future use)
 - e. 2 x RGB full spectrum LED status indicators
2. The Nyquist NQ-E7010 I/O Controller shall support wall or shelf-mounting options and shall include the required mounting bracket hardware.
3. The Nyquist NQ-E7010 I/O Controller shall be designed for wall or shelf mounting.

F. Bogen Analog Call Switch CA-15C

1. The momentary Call Switch shall be capable of placing a combination of Normal/Urgent/Emergency Calls based on the software configuration of the Call Switch.
2. Normal/Emergency call configuration: Making a Normal call in this mode involves pressing the button on the Call Switch once. A call is then placed to the designated Admin Station. An Emergency call involves pressing the call switch at least four times. The Emergency call is then routed to the designated Admin Station. In both scenarios, the calling station number and call-in level (Normal or Emergency) are displayed on the Admin Station or on a group of Admin Stations. Additionally, Emergency calls can be routed to an alternative Admin Station or Emergency Link.
3. Urgent/Emergency call configuration: Making an Urgent call in this mode involves pressing the button on the Call Switch once. A call is then placed to the designated Admin Station. An Emergency call involves pressing the button on the Call Switch at least four times. The Emergency call is then routed to the designated Admin Station. In both scenarios, the calling station number and call-in level (Urgent or Emergency) are displayed on the Admin Station or on a group of Admin Stations. Additionally, Emergency calls can be routed to an alternative Admin Station or Emergency Link.
- A. Emergency Only call configuration: Making an Emergency call in this mode involves pressing the Emergency call switch with Call Level Emergency one time. The call is then switched to the Admin Station. This requires the display of the station number and call-in level on the Admin Station or on a group of Admin Stations. Additionally, Emergency calls can be routed to any Admin Station, including Emergency Link.
4. Emergency Link Transfer - If an Emergency call goes unanswered by the Admin Station and the Emergency link transfer is active, the Emergency call will be forwarded to the loudspeaker associated with the Emergency Link Station. Any station equipped with a loudspeaker can be programmed as the Emergency Link Transfer. Systems that do not provide Emergency Link Transfer shall not be considered equal.
5. In addition to the mechanical click of a Call Switch button press, a call confirmation audio file shall be played on the associated loudspeaker when a call is placed. The three call-in levels shall have distinct audio confirmation messages:
 - a. Call Placed
 - b. Urgent Call Placed
 - c. Emergency Call Placed

G. Loudspeakers for use with the Nyquist ASB

1. Classroom Speakers shall be Bogen:
 - a. Ceiling Mounted Acoustical Tile Speakers: CSD2X2U Drop-In Ceiling Speaker
 - b. Ceiling Mounted Gypboard Speakers: S810T725PG8U Ceiling Speaker
 - c. Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker
2. Hallway Speakers shall be Bogen:
 - a. Ceiling Mounted Acoustical Tile Speakers: CSD2X2U Drop-In Ceiling Speaker
 - b. Ceiling Mounted Gypboard Speakers: S810T725PG8U Ceiling Speaker
 - c. Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker
3. Outdoor/Gym/Locker Room Speakers shall be Bogen:
 - a. FMH15T mounted in BBSM6 surface-mounted vandal-resistant enclosure/BBFM6 flush-mounted vandal-resistant enclosure with FMHAR8 adapter ring and SGHD8 heavy duty grille
 - b. KFLDS30T Wide Dispersion Re-entrant Horn Loudspeakers
4. Common Area Speakers shall be Bogen:
 - a. OCS1 Orbit Ceiling Speakers
 - b. OPS1 Orbit Pendant Speakers

H. Uninterruptible Power Supply (UPS) for Intercom System

1. The intercom electronics at each rack shall be plugged into an uninterruptible power supply which operates in a hot standby state when the AC power is present, providing power of consistent quality. Also, the switch over time must not be more than 3.5 microseconds. UPS shall be rack mounted and be a minimum of 2200 VA capacity, 120 volt input. UPS shall have network management capability and be manufactured by APC. Provide Smart UPS with network management card 2 with environmental monitoring.

I. PoE Clocks: Dukane 24IIP with double sided 4-digit red lettering (12 hour format), black aluminum housing, integral RJ45 interface, and flush ceiling grid mounting hardware. Provide with 36 month warranty. Where shown wall mounted, provide single sided with wall mount hardware.

J. Network Electronics for Intercom System

1. Contractor shall interface to RCSS provided LAN network electronics as required to activate all intercom devices.
2. Division 26 shall be responsible for patching in all patch cords at electronics, assigning IP addresses, and configuring switches per Owner's requirements to interface Owner provided LAN electronics.
3. Intercom devices shall be connected to Owner provided RCSS PoE (power over Ethernet) LAN Base series switch, web based development manager, and have layer 3 capability.
4. Electronics to be mounted in data rack.

2.04 SYSTEM CAPABILITIES

- A. The communication system shall be a Bogen Nyquist E7000 Series Educational System and shall provide a comprehensive communications network between administrative areas and staff locations throughout the facility.

The system shall provide no less than the following features and functions:

1. Software-based, state-of-the-art, Voice over IP (VoIP) paging and intercom solution.
1. The system shall provide a Web User Interface (Web UI) shall allow users to configure and control the system, in accordance with their assigned User Role, from any Web browser enabled PC, Mac, Android or iOS tablet or mobile device.
2. Amplified-voice communication with analog loudspeakers shall use a shielded audio pair when connected to an ASB.
3. The system shall support any combination of the following VoIP phone station types: NQ-T1100 Administrative VoIP Phone – Color Touch Display (Admin Station) or NQ-T1000 Staff VoIP Phone – LCD Display (Staff Station).
 - a. All VoIP phone station types shall utilize the same type of field wiring.
 - b. There shall be no limit to the number of Admin Stations that can be connected to a facility. Systems that require different head-end equipment to make Admin Stations function, or systems that limit the number of Admin or Staff Stations shall not be deemed acceptable.
4. Future station alterations shall only require the Station Type to be changed in system programming. Alterations shall not require field wiring or system head-end alterations, unless an analog station device is being replaced by a VoIP station device or vice-versa.
5. The system shall be a global non-blocking system. The system shall be capable of unlimited amplified intercom paths per facility. Two amplified intercom paths shall be provided with each ASB for its complement of 24 stations. All hardware, etc., required to achieve the necessary number of amplified-voice intercom channels for this system shall be included in this submittal. ASB amplified-voice intercom channels shall provide voice-activated switching. Systems requiring the use of a push-to-talk switch on administrative telephones shall not be acceptable. There shall be an automatic level control for return speech during amplified-voice communications. The intercom amplifier shall also provide control over the voice switching sensitivity and delay times of the VOX circuitry on the ASB.
6. The system shall provide 911 Dial-Through via outside FXO/FXS lines or SIP trunks to ensure that one or more lines are always available for 911 calls. The 911 Dial-Through is available to any properly configured station (via CoS). When a station dials 911, the 911 call is processed as follows:
 - a. Call routes to an Emergency Group where the call can be answered.
 - b. The 911 CO lines can be pre-configured and reserved. If the 911 reserved lines are busy, the normal CO lines will be connected to route the 911 calls. If all the normal CO lines are busy, then one of the ongoing calls shall be disconnected and the 911 call shall be placed.
 - c. When 911 is dialed from any station, its designated Admin Station or Admin Group will receive a message that the station has dialed 911.

- d. The system shall automatically record all 911 calls made from any station. The 911 call recording shall begin as soon as 911 is dialed and shall continue until the call is terminated. Recorded calls shall be maintained on the system for later playback review and/or retrieval by authorized personnel and/or authorities.
7. It is of highest importance that Emergency calls from stations receive prompt attention. Therefore, it is important that there be an alternative destination in case the Emergency call does not get answered at the primary location. Details are as follows:
 - a. Staff-generated Emergency calls shall be treated as the second highest system priority. Therefore, all Emergency calls shall announce at the top of the call queue of their respective Admin Station or Admin Group. Should that Emergency call go unanswered for 15 seconds, the call shall be re-routed to an alternative speaker station. Then, a tone will prompt the caller to make a verbal call for help and announces to the Emergency link station "Emergency." During the transfer, the original administrative telephone shall continue to ring the distinctive Emergency Ring. Should the Emergency Transfer-to-Station have an associated Admin Station, it will also ring for the Emergency call.
 - b. The Emergency Transfer-to-Station shall be software configurable.
 - c. Systems failing to transfer unanswered Emergency calls or failing to immediately connect to the designated Admin Station shall not be deemed as equal.
 8. There shall be a Facility Wide Emergency All-Call feature. The Emergency All-Call shall be accessed from designated Admin Stations or the Nyquist Dashboard or by the activation of an external contact closure that shall give a microphone input Emergency status. The Emergency All-Call function shall have the highest system priority and shall override all other loudspeaker-related functions including Time Tones, Normal All-Call or Zone Pages, or Audio Distribution.
 - a. Considering that Emergency calls are to be treated with the highest level of concern, systems that do not regard Emergency All-Call with the highest priority shall not be deemed as equal.
 - b. Upon touching the Directory icon, a menu shall appear on the Admin Station display prompting the user to select the desired menu.
 - c. The Emergency All-Call shall capture the highest-level system priority and shall be transmitted over all speakers in the facility. It shall also be capable of activating an external control output, which can be used to activate external relays to automatically override volume controls, local sound systems, or strobe circuits.
 - d. Systems without Emergency All-Call or systems with All-Call that cannot be activated by external means or that do not capture complete system priority or activate an external relay, shall not be acceptable.
 9. There shall be unlimited Alarm Tones (four by default). Each may be accessed by dialing *91 and the two-digit tone number from any Admin Station, SIP Trunk, or FXO/FXS system interface. These Alarm Tones are separate from the Time Tones. Users shall be able to add an unlimited number of Alarm Tones to the system by uploading MP3 or WAV files. Systems that do not allow the user to upload MP3 and WAV files to customize the Alarm Tones or need to use external alarm/tone generators or special software or have less than four Emergency Alarm Tones shall not be acceptable.
 10. Upon touching the Directory icon on an Admin Station, a menu shall appear on the display prompting the user to select from the sub-menus. The Alarms sub-menu is the first available. This precludes the user from having to memorize complicated key sequences to access Alarm Tones.

11. There shall be unlimited I/O Controller relay driver outputs accessible and controllable by properly authorized users via an Administrative Web UI. These outputs remain set until accessed and reset. Users shall have the ability to review the status of each relay driver output. Users shall be prompted through fields via a plain English menu, precluding users from having to remember any dialing sequences to control this feature. The system shall support an unlimited number of I/O Controllers, and each I/O Controller shall be able to interact with any and all other I/O Controllers on the system (i.e., an input on one I/O Controller can trigger an output on one or more different I/O Controllers). Systems that require the user to remember complicated dialing schemes or prompt the user via cryptic commands shall not be acceptable.
 - a. The I/O Controller can create a contact closure when the following operations are performed in the system:
 - i. 911 call placed
 - ii. Audio Distributed
 - iii. Alarm is played
 - iv. Announcement is played
 - v. All-Call preformed
 - vi. District All-Call performed
 - vii. District-Emergency-All-Call
 - viii. Emergency-Call
 - ix. Emergency-All-Call
 - x. Audio-Disabled
 - xi. Page
12. The system shall provide software controlled and programmable control outputs for external relay activation for use with strobe lights, magnetic locks, card access systems, motion detectors, cameras, or any low-voltage, dry contact creating device. Systems using dedicated security stations for control of external functions shall not be acceptable.
13. The system shall be capable of interfacing to PSTN/PBX/iPBX via both FXO/FXS line and SIP trunk connectivity.
14. The system shall be capable of providing each facility (i.e., (i.e., Nyquist location) an unlimited number of incoming FXO/FXS or SIP trunk lines that can be designated by the user to ring the designated Day Admin or Night Admin. Where an Admin Station is designated to receive outside line calls, the incoming call's Caller ID information shall appear on the display. The system shall also provide the ability to make outside line calls from Admin Stations. This ability shall be programmable for each Admin Station and there shall be an unlimited number of CoSs available to assign to any station.
15. The system shall be capable of supporting DID, DISA, and Security DISA functions.
 - a. The system shall provide a password-protected Security DISA feature that shall only be accessible from authorized Police, Fire, Emergency personnel, or an off-premise security office that monitors the facility's security system. The Security DISA feature shall function as follows: Upon dialing the Security DISA phone number, the caller will receive a dial tone from the system, after which he or she must enter the assigned Security DISA passcode on the dial pad. Upon confirmation, the system will present the dial tone again and will allow the authorized personnel to dial any station/classroom on the system and monitor the activity without any pre-announce tone or privacy beep. This will allow the authorized personnel to audibly assess the situation and determine what actions need to be taken.
 - b. All DISA and Security DISA calls shall be automatically recorded by the system for later playback review and/or retrieval by authorized personnel and/or authorities.
16. The system shall provide for field-programmable three-, four-, five-, or six-digit architectural station numbers.
17. There shall be an automatic level control for return speech during amplified-voice communications.

18. Each station loudspeaker shall be assignable to all or any combination of Paging, Time, and/or Audio Zones. Systems that do not provide unlimited Paging, Time, and/or Audio Zones shall not be acceptable.
19. There shall be unlimited schedules with unlimited programmable events per facility. Each event shall sound one user-selected tone or external audio source. It shall be possible to assign each schedule to a day of the week or to manually change schedules from an authorized user via a web-based UI. Systems that do not provide unlimited schedules, events, and tones, or that require software to be installed on a PC to perform these functions shall not be acceptable.
 - a. The system shall provide multiple concurrent schedules per facility/location to accommodate split facilities (for example., combined Elementary and Middle School, combined Middle and High School, etc.).
 - b. The system must be capable of providing Class Change Music to be played from an external audio source or audio files that are stored in playlists on the system during class change periods or whenever a facility wants music to be played in an area (i.e., one or more Time Zones) on an automated schedule.
 - c. Each event shall be able to be directed to any one or more of the unlimited Time Zones.
 - d. Each of the unlimited Time Zones shall have a programmable, customizable Preannounce Tone and volume control that is unique unto itself.
 - e. Each event shall play any of the Normal tones or external audio. Each event may utilize a different tone. For example, the system shall be capable of sending the gymnasium, shop classes, and pool a separate, unique time tone to indicate "clean up." Minutes later, the entire facility can be sent a different time tone to indicate class change.
 - f. Each of the unlimited Time Tones may be manually activated by selected VoIP Admin Phones or via an authorized user with access to the Web UI. These tones shall remain active as long as the telephone remains off-hook or until canceled from the keypad or the Nyquist Web UI.
1. Systems that do not provide an unlimited number of schedules or do not provide automatic activation of schedules shall not be acceptable.
20. The Nyquist E7000 is capable of synchronizing with an NTP server and automatically adjusting the Daylight Savings Time for any time zone in the world. The server that the Nyquist E7000 application is running on can also be used as an NTP server for other systems on the LAN (for example, IP Clocks and control systems).
21. There shall be a Zone Page/All-Call Page feature that is accessible by selected Admin Phones and FXO/FXS or SIP connection to the PSTN or PBX/iPBX.
22. There shall be an option to play a pre-announce tone at any loudspeaker selected for voice paging.
23. There shall be a voice-intercom feature that is accessible by CoS authorized staff phones, all Admin VoIP phones, and Admin Web UIs.
 - a. There shall be a privacy beep played every 15 seconds at any selected loudspeaker to indicate that an intercom call is in progress.
 - b. There shall be a pre-announce tone played at any selected loudspeaker for intercom call communication.
 - c. For special applications, the privacy and pre-announce tone signals shall be capable of being disabled during system initialization.

- d. There shall be a switch over to private telephone communications should the person at the classroom loudspeaker pick up his or her Staff Station and dial *3 to transfer the call down to the associated classroom Staff Station.
24. There shall be various levels of telephonic communication accessible by all Admin Stations and Staff Stations.
 - a. Staff Stations must be capable of being programmed to ring one Admin Station during day hours and a different Admin Station during night hours. Day and Night start hours shall be configurable. Staff Stations shall be capable of being assigned to any Admin station. Systems that limit the number and assignment of staff call-ins to an Admin Station shall not be acceptable.
 25. Each VoIP speaker or ASB speaker equipped with a call switch (analog or digital) shall be configurable as one of three call-in types, as follows:
 - a. Normal/Emergency
 - b. Urgent/Emergency
 - c. Emergency
 27. Call buttons programmed for access Normal / Emergency or Urgent / Emergency shall be able to initiate an Emergency call by repeated flashing of the phone's hook switch, or repeated pressing of the DCS or the Call Switch. Systems that require additional switches and/or conductors to initiate an Emergency call, shall not be acceptable.
 28. Normal and Urgent calls shall be placed into the queue for the designated Admin Station or Admin Web UI.
 29. Each Admin Station call queue shall first be sorted per call priority (for example, Emergency, then Urgent, and then Normal). Calls are sorted within each priority level on a first-in, first-out basis. When a call is answered, it shall automatically be removed from the queue. Systems that do not sort calls per priority and order received shall not be acceptable.
 - a. The display shall simultaneously display a minimum of three intercom calls pending.
 - b. Additional calls beyond three shall be indicated by a scrolling option on the right-hand side of the screen thus prompting the user that additional calls are waiting.
 30. It shall be possible to answer any incoming call by picking up the handset while it is ringing. It shall not be necessary to press any buttons to answer a call unless the call has dropped into the queue.
 32. System programming shall be from an authorized Nyquist Admin User via any web browser. A valid username and password shall be required to gain access to the following programmable functions:
 - a. System Parameters – Allow installers to adjust core system parameters.
 - b. Zones – Allow installers to create and modify Paging, Time, and Audio Zones.
 - c. Schedules – Allow installers and administrators to create Bell Schedules for the facility, predefine alternative schedules to run. Holiday Events prevent the bells from ringing on a school holiday. The system shall allow an unlimited number of schedules to operate simultaneous within a facility.
 - d. Admin Groups – Allow the installer to create, modify, and delete software groupings of admin phones that can ring when a station calls in with a call switch.
 - e. CoS Configuration – Allow the installer to create, modify, and delete CoS groups that can have the following features defined: Call in Level, Zone Paging, All-Call Paging, Emergency All-Call, Inter-Facility Call/Page, Audio Distribution, Remote Pickup, Join Conversation, Call Forwarding, Walking Class of Service, External Call Routing, Call Transfer/3-way Calling, Manually Activate Tone Signals, Call any Station, Manage Recording, Monitor Calls, Monitor Locations, Conference Admin, Conference User,

- Voicemail, Record Calls, Activate Alarm Signals, Disable Audio, Enable Audio, Allow Callee Auto-answer, District Paging, and Inter-Facility Features.
- f. Stations – Allow the installer to set up, modify, delete stations, set up Page Exclusion, view stations’ status, and add a station.
 - g. Bridge Devices – Allow the installer to install the Nyquist ASBs.
 - h. Audio – Allow the installer to upload and manage Announcements, Playlists, Announcements, Songs, and Tones. The must supports the uploading of both MP3 and WAV files making Audio file management simple for users. Systems that limit the size of Audio files shall not be considered equal.
 - i. Users – Allow the installer to manage users by giving them the proper Role and assign an Extension if needed.
 - j. Roles – Allow the installer to limit user to the following: create, delete, edit, restart server, sort menu, systems update, manage, import/export, restore, settings, or view.
 - k. Facilities – Allow the installer to set up the district wide facilities for remote paging and calling.
 - l. Outside Line – allow the installer to set up FXS and FXO ports for inbound and outbound system calling.
 - m. SIP Trunks – allow the installer to set up SIP trunks into the facility for inbound or outbound calling.
 - n. Call Details – allow the installer to review the historical system activities that can be used for incident investigation or system troubleshooting.
 - o. System Backup/Restore – allow the installer to preform system backup or restores and allow the backups to be schedule to run automatically.
 - p. System Logs – allow the installer to view and export Server, Nyquist-Intercom, and Web Server logs that can be used for trouble shooting and technical assistance.
 - q. Paging Exclusions – allow the installer to view and edit station that are excluded from paging.
 - r. Firmware – is used to update Nyquist appliances.
 - s. Help –Provides information about the system, online help topics, and System Administrator Manual.
 - t. Systems not capable of supporting web-based configuration and control, or require plugins or dedicated application software, shall not be deemed as equal.
 - u. Systems that require a Serial-to-Ethernet converter, or require additional application software on a PC for configuration and/or control shall not be deemed as equal.

33. Admin Group

- a. Admin Stations can be placed into Admin Groups, which are used if incoming calls are not answered by the assigned Admin Station or the Day or Night Admin associated with the Admin Station. Admin Groups act as an always answer feature by providing an alternate list of Admin Stations. If an incoming call is not answered by the assigned Admin Station within 30 seconds for normal calls or 15 seconds for emergency calls, all Admin Stations in the Admin Group will ring.
- b. If Call Forwarding is enabled at the Admin Station, Nyquist tries the forwarded extension. If that station does not answer or is busy, the call timeout is reduced to 15 seconds. After 15 seconds, the call rolls over to the Admin Group.
- c. If an Emergency level call receives no answer, the Admin Group will ring if the Day Admin or Night Admin does not answer.
- d. Admin Stations can be assigned to multiple Admin Groups. A Day or Night Admin can also be assigned to one or more Admin Groups.

34. Call Detail Reporting

- a. The Call Details feature allows the viewing and/or printing of detail records of every call in a facility in a call log format. Calls include scheduled announcements, paging, and internally and externally made or received telephone calls.

35. System Backup/Restore

- a. The system backup feature allows users with access to back up the system database, voicemail, and recordings.
- b. The system restore allows users with access to perform a system restore of previously backed up database, voicemail, and/or recordings.
- c. The installer also can set up an automatic backup that can be performed daily, weekly, or monthly.

36. System Log Files

- a. A log file records either events or messages that occur when software runs and is used when troubleshooting the system. The following parts of the Nyquist system generate log files:
 - i. Server (This provides access to the Debian Linux OS server log files.)
 - ii. Intercom (This provides access to the Intercom application server log files.)
 - iii. Web Server (This provides access to the web server log files.)
- b. From the web-based UI, system logs can be viewed directly or exported via download to a PC, Mac, or Android device and then copied to removable media or attached to an email to technical support.

37. Paging Exclusions

- a. For school testing and exams, the administrators shall be able to put stations into Page Exclusion mode. During this time, the stations will only receive Emergency All-Call pages – not music, tones, or All-Calls. Emergency pages will still be heard at the station even if that station is set to exclude paging.

3.01 EXAMINATION

- A. Examine conditions, with the installer present, for compliance with requirements and other conditions affecting the performance of the Nyquist E7000 Series Educational System.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 EQUIPMENT MANUFACTURER'S REPRESENTATIVE

- A. All work described herein to be done by the manufacturer's authorized representative shall be provided by a documented factory authorized representative of the basic line of equipment to be utilized.
- B. As further qualification for bidding and participating in the work under this specification, the manufacturer's representative shall hold a valid C-10 Contractor's License issued by the Contractor's State License Board of [your state]. The manufacturer's representative shall have completed at least 10 projects of equal scope, giving satisfactory performance, and shall have been in the business of furnishing and installing sound systems of this type for at least five years. The manufacturer's representative shall be capable of being bonded to ensure the owner of performance and satisfactory service during the guarantee period.
- C. The manufacturer's representative shall provide a letter with submittals from the manufacturer of all major equipment stating that the manufacturer's representative is an authorized distributor. This letter shall also state that the manufacturer guarantees service performance for the life of the equipment and that there will always be an authorized distributor assigned to service the area in which the system has been installed.
- D. The contractor shall furnish a letter from the manufacturer of the equipment. This letter shall certify that the equipment has been installed according to factory intended practices, that all the components used in the system are

compatible, and that all new portions of the systems are operating satisfactorily. Further, the contractor shall furnish a written unconditional guarantee, guaranteeing all parts and all labor for a period of five years after final acceptance of the project by the owner.

3.03 DIVISION OF WORK

- A. While all work included under this specification is the complete responsibility of the contractor, the following division of actual work listed shall occur:
 - 1. The conduit, outlets, terminal cabinets, etc., which form part of the rough-in work, shall be furnished and installed completely by the electrical contractor.
 - 2. The balance of the system, including installation of speakers and equipment, making all connections, etc., shall be performed by the manufacturer's authorized representative. The entire responsibility of the system, its operation, function, testing and complete maintenance for one year after final acceptance of the project by the owner, shall also be the responsibility of the manufacturer's authorized representative.

3.04 INSTALLATION

- A. The installation, adjustment, testing, and final connection of all conduit, wiring, boxes, cabinets, etc., shall conform to local electrical requirements and shall be sized and installed in accordance with the manufacturer's approved shop drawings.
- B. Low-voltage wiring may be run exposed above ceiling areas where they are easily accessible.
- C. The contractor shall install the new system at the location shown on the plans.
- D. All Staff Stations and Call Switches shall be wall-mounted:
 - 1. Mount at 46" AFF.
 - 2. All wiring should be concealed.
 - 3. Verify exact location with architect.
 - 4. Avoid mounting near doors to prevent students from activating and running out of the rooms.
- E. Admin Stations can be desk or wall mounted.
- F. Speaker and telephone lines run above ceiling and not in conduit shall be tie-wrapped to a ceiling joist with a maximum spacing of 8' between supports. No wires shall be laid on top of ceiling tile.
- G. Connect field cable to each Analog Speaker transformer using UL butt splices for #22 AWG wire.
- H. Contractor shall provide a minimum of eight hours of configuration and operational instruction to school personnel.
 - 1. Bogen Communications, Inc., shall provide online "How To" videos for instructing the teaching staff on how to operate the Teacher Dashboard aspect of the system.
- I. On the first school day following installation of the Nyquist System, the contractor shall provide a technician to stand by and assist in system operation.
- J. Mark and label all demarks IDF and MDF points with destination point numbers. Rooms with more than one outlet shall be marked XXX-1, XXX-2, XXX-3, etc. where XXX is the room number.
- K. No graphic room number shall exceed the sequence from 000001 through 899999.

1. All outside speakers shall be on a separate Page Zone and Time Zone.
 2. All zones shall be laid out not to exceed 40 Watts (@25V) maximum per zone.
 3. All hallway speakers shall be tapped at 1-Watt (@25V) maximum.
 4. All outside horns shall be tapped at 3.75 Watts (@25V) maximum.
 5. All classroom speakers shall be tapped at ½ Watt (@25V) maximum.
 6. Large rooms, such as cafeterias, shall be tapped at 2 Watts (@25V) maximum.
- L. Plug disconnect: All major equipment components shall be fully pluggable by means of multi-pin receptacles and matching plugs to provide for ease of maintenance and service.
- M. Protection of cables: Cables within terminal cabinets, equipment racks, etc., shall be grouped and bundled (harnessed) as to type and laced with No. 12 cord waxed linen lacing twine or T and B wire-ties, or hook and loop cable management. Edge protection material shall be installed on edges of holes, lips of ducts, or any other point where cables or harnesses cross a metallic edge.
- N. Cable identification: Cable conductors shall be color-coded and individual cables shall be individually identified. Each cable identification shall have a unique number located approximately 1-1/2" from cable connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings.
- O. Shielding: Cable shielding shall be capable of being connected to common ground at point of lowest audio level and shall be free from ground at any other point. Cable shields shall be terminated in the same manner as conductors.
- P. Provide complete "in service" instructions of system operation to school personnel. Assist in programming of telephone system.

3.04 GROUNDING

- A. The contractor shall provide equipment grounding connections for Integrated Telecommunications/Time/Audio/Media System as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to ensure permanent and effective grounds.
- B. The contractor shall provide ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments.
- C. The contractor shall provide all necessary transient protection on the AC power feed and on all station, lines leaving or entering the building.
- D. The contractor shall note on their drawings the type and locations of these protection devices and all wiring information.
- E. The contractor shall furnish and install a dedicated, isolated earth ground from the central equipment rack and bond to the incoming electrical service ground buss bar.

3.05 DOCUMENTATION

Provide the following directly to the Supervisor of Technology Services.

- A. One printed copy of all field programming for all components in system

- B. One copy of all diagnostic software with a copy of field programming data for each unit
- C. One copy of all field wiring runs, location, and end designation of system

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 27 02 10 - DATA/VOICE NETWORKING

1.01 SUBMITTALS

- A. Prior to start of any work, contractor shall submit shop drawings as follows:
 - 1. Manufacturer's published literature for each separate type of equipment being provided. Indicate model number on cutsheet.
 - 2. One line schematic of complete system showing a floor plan to scale. Show locations and the type of outlets, as well as all rack locations, and estimated maximum distances to each rack.
 - 3. Documentation of testing on all wiring and terminations as per EIA/TIA standards.

1.02 MANUFACTURERS

- A. Acceptable manufacturers for each type of equipment specified shall be as noted throughout this specification section.
- B. The acceptable manufacturers noted shall be installed by the authorized local factory dealer/representative for that product.
- C. The contractor shall hold a current low voltage contractor's license and RCDD certificate. Any other interested parties shall submit a company resume showing years in business, certification stating that he is an authorized representative for the manufacturer of the equipment he is submitting for approval and that he maintains a fully equipped and stocked service shop and shall respond to service calls within 12 normal working hours, list of key personnel, copies of appropriate licenses and list of recently completed jobs. Submittal must be received no later than ten business days prior to bid date in order to be considered.

1.03 GENERAL

- A. **Workmanship**
All work shall be performed in a workmanlike manner. Architect, Engineer, and/or Owner may observe the work procedures and workmanship of the Contractor but such observation will not relieve the contractor from responsibility for performance.
- B. **Warranty**
The Contractor shall furnish a written warranty that describes the equipment supplied under these specifications will be free from defects of materials and workmanship for a period of fifteen years from the date of final acceptance unless otherwise specified and that all defects occurring within that period shall be corrected in a timely manner at no cost to the Owner.
- C. **Contractor's Qualifications**
Contractor shall be required, before awarding of contract, to demonstrate to the complete satisfaction of the Engineer that he has the necessary facilities, ability and financial resources to execute the work in a satisfactory manner and within the time specified; that he has had experience in construction work as same or similar nature; that he has past history and references which will assure the Owner of his qualifications for executing the work.

Contractor shall submit a copy of a valid low-voltage license (Low-Voltage General, Low-Voltage Telecommunications or Low-Voltage Unrestricted as issued by the State Construction Industry Licensing Board of Low-Voltage Contractors).

Contractor shall submit a copy of a BICSI (Building Industry Consulting Service International) certified RCDD (Registered Communications Distributions Designer) certificate.

- D. Comprehensive list of references
Attach a detailed list of references along with contact person, dates of work, mailing address, telephone numbers.
- E. Contractor must provide proof of installation in a minimum of five sites using an enhanced Category 6e structured cabling with 100 or more active (working) nodes installed.
- F. Data/Voice System Subcontractor shall submit a certification stating that he is an authorized representative for the manufacturer of the equipment he is submitting for approval and that he maintains a fully equipped and stocked service shop and shall respond to service within 12 normal working hours.

1.04 SCOPE OF WORK

A. Scope of Project Standards and Description

The cabling and wiring placed for voice and data communications on this undertaking shall be "Unshielded Twisted Pair" type and conform to the requirements contained in the latest editions of the National Electric Code (NEC) and the latest editions of the following American National Standards Institute (ANSI) specifications:

1. TIA/EIA 568-Commercial Building Telecommunications Wiring Standard
2. TIA/EIA 569-Commercial Building Standard for Telecommunications Pathways and Spaces
3. TIA/EIA 606-Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
4. TIA/EIA 607-Commercial Building Grounding and Bonding Requirements for Telecommunications
5. Addendums to TIA/EIA 568

- B. Specifications for the Fiber Optic Backbone, Jacks and Outlets, Horizontal Wiring, and Patch Panel are provided in this specification section.

1.05 GUARANTEES

- A. All communication outlets wired and serviceable must be tested and certified in compliance with TIA/EIA 568-C.2-1 enhanced Category 6e specifications. Testing must be "end-to-end". Test results shall be forwarded to Engineer a minimum of one week prior to final inspection.

1.06 TESTING AND CERTIFICATION

- A. Testing fiber optic and copper distribution systems are crucial in assuring the overall integrity and satisfactory performance of the network. Test results quantify system

quality, identify system faults, and establish the baseline accountability performance of the system. Proper testing also maximizes the longevity of the system, minimizes downtime and maintenance, and facilitates system upgrades or reconfiguration.

- B. The Contractor shall provide proof of communications wiring systems certification and testing certification.
- C. All data and voice wiring and terminations shall be tested and must pass TIA/EIA standards for enhanced Category 6e Cabling. All faults shall be corrected.
- D. All test results must be printed and show the following primary results:
 - 1. Wire map
 - 2. Length
 - 3. Insertion Loss
 - 4. Near-end crosstalk (NEXT)
 - 5. Power sum near end crosstalk (PSNEXT)
 - 6. Equal-level far-end crosstalk (ELFEXT)
 - 7. Power sum equal-level far-end crosstalk (PSELFEXT)
 - 8. Return Loss
 - 9. Propagation delay

1.07

OPTICAL FIBER CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CommScope, Inc.
 - 2. Berk-Tek; a Nexans company.
 - 3. Corning Cable Systems.
 - 4. General Cable Technologies Corporation.
 - 5. Mohawk; a division of Belden CDT.
 - 6. Superior Essex Inc.
 - 7. Hellerman Tyton Connectivity Devices
 - 8. Hitachi Cabling
- B. Description: Singlemode (OM3), Laser-optimized 50/125 -micrometer, 6-fiber, nonconductive, tight buffer, optical fiber cable.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide CommScope Uniprise LazrSPEED 550 cabling or comparable product by one of the listed manufactures.
 - 2. Comply with ICEA S-83-596 for mechanical properties.
 - 3. Comply with TIA/EIA-568-B.3 for performance specifications.
 - 4. Comply with TIA/EIA-492AAA-D for detailed specifications.
 - 5. Comply with ISO 11801for OM4 performance, Laser-optimized 50 micrometer fibers with 4700 MHz.km EMB at 850 nm.
 - 6. Comply with IEC 607 93-2-10 for TYPE A1a.3 performance, Laser-optimized 50 micrometer fibers with 4700 MHz.km EMB at 850 nm.

7. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
 - Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
 - Riser Rated, Nonconductive: Type OFNR, complying with UL 1666.

C. Jacket:

1. Jacket Color:
2. Aqua for multimode cable.
3. Yellow for singlemode cable
4. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.
5. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

1.08 OPTICAL FIBER CABLE HARDWARE

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

B.ADC.

C.American Technology Systems Industries, Inc.

D.Berk-Tek; a Nexans company.

E.Corning Cable Systems.

F.Dynacom Corporation.

G.Hubbell Premise Wiring.

H.Molex Premise Networks; a division of Molex, Inc.

I.Nordex/CDT; a subsidiary of Cable Design Technologies.

J.Optical Connectivity Solutions Division; Emerson Network Power.

K.Siemon Co. (The).

L.Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

M.Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

N.Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths.

O.Cable Connecting Hardware:

P.Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.

Q.Quick-connect, simplex and duplex, Type SC connectors. Insertion loss not more than 0.75 dB.

R.Type SFF connectors may be used in termination racks, panels, and equipment packages.

1.09 LOCAL AREA NETWORK (LAN) JACK AND OUTLET SPECIFICATIONS

A. Locations shown on drawings will be equipped with a consistent arrangement of LAN communications outlets.

B. Outlet faceplate for this arrangement shall be configured in the following fashion:

1. The jacks used shall fit properly in the outlet openings of the outlet faceplate. The jacks used shall conform to enhanced Category 6e parameters of TIA/EIA 568-C.2-1
 - a. In a properly installed enhanced Category 6e UTP cabling system, the jacks used shall be capable of supporting LAN data rates of 1000 Mbps.
 - b. The wiring arrangement of the jack shall conform to the TIA/EIA 568.
 - c. The jack shall possess the following characteristics:
 1. The eight (8) position / eight (8) conductor jack shall be capable of supporting the previously defined data rates as well as voice (including ISDN).
 2. Utilization of 110 type or equivalent insulation displacement hardware for horizontal wire attachment and acceptance of 22 or 24 AWG conductors.
 3. The jack wires shall consist of 50 micro-inch lubricated gold plating over 100 micro-inch nickel underplating.
 - d. Any vacant faceplate position shall be reserved for future growth and should have a dust cover/blank inserted.
- C. Acceptable Manufacturer's: Mod-Tap, Ortronics, AT&T, AMP, and Hubbell, Interlink, Leviton, Panduit, and Siemon.
- D. Each jack shall have faceplate labeled. Also neatly label backside of faceplate with a permanent marker to note jack number.
- E. Labeling of multiple drops in a common space shall be sequentially numbered. Numbers shall not be assigned randomly. Coordinate prior to terminating at racks, no exceptions.
- F. See drawings for jacket color required.
- G. For all "WAP" drops, cabling shall be plenum rated Cat. 6A (augmented) cable. See drawings for additional information.

1.10 LOCAL AREA NETWORK (LAN) HORIZONTAL WIRING SPECIFICATIONS

- A. This section covers the cable from the communications outlet to the patch panel in the MC and all IC wiring closets. These cables shall be Enhanced Category 6e Unshielded Twisted Pair cable. Each cable shall be placed in a "point-to-point" fashion from the work area outlet to the wiring closet for each communications outlet needed. There shall be no intermediate splices or cross connects in these cables.
- B. The characteristics of the horizontal cable are as follows:
 1. Enhanced Category 6e cable consisting of four pair of 23 AWG bare solid copper conductors insulated with a plenum rated material. The insulated conductors are tightly twisted into pairs and jacketed with plenum rated material. No type of shield is required in the sheath.

2. Each sheath shall contain four unshielded copper pairs. Each pair shall have a different twist per foot ratio ranging from 12 to 24 twists per foot. No more than 1/2" inch may be untwisted and the sheath may not be stripped back more than 1/2" inch at the jack during installation.
 3. Cable shall have central crossweb to minimize crosstalk between pairs.
- C. The cable component shall meet or exceed the following requirements:
1. ASNI/TIA 568-C.2 "Commercial Building Telecommunications Standard, Part 2: Balanced Twisted-Pair Telecommunications Cabling and Components Standard"
 2. ASNI/TIA 1152 Requirements for Field Test Instruments and Measurements for Balanced Twisted Pair Cabling "
 3. Certified Enhanced Category 6e Cable under Third Party Cable Certification Program.
 4. ICEA S-102-700
 5. ANSI/ICEA S-102-732
 6. UL Standard 444
 7. National Electric Code - Article 800
- D. Subject to compliance with specification requirements, the only acceptable Enhanced Cat-6e cables approved for use as follows:
1. Mohawk Advancenet
 2. Hittachi HCM Premium series
 3. Belden Datatwist 3600
 4. General Cable Genspeed 6000
 5. Berk-Tek Lanmark 1000
- E. Plenum rated cable shall be used. The plenum cable shall be composed of four pair of 23 gauge bare solid copper conductors insulated with a plenum rated insulation that is the same material configuration on all four pairs, 3+1 or 2+2 designs are not allowed. The insulated conductors are tightly twisted into pairs and jacketed with low smoke plenum rated PVC. It shall conform to a NEC Type CMP for plenum and NEC Type CMR for riser applications.

1.11 LOCAL AREA NETWORK (LAN) PATCH PANEL SPECIFICATIONS

- A. This section covers the termination hardware located in the MC and IC (wiring closet). The termination hardware shall provide the capability to be able to patch connections between ports on the LAN hardware (electronics) and the horizontal cables to the classrooms.
- B. The Patch panels shall be enhanced Category 6e Modular Jack Panels.
- C. The termination hardware will be co-located on 19" inch racks with the LAN electronics. The configuration of the patch panels shall be in an agreement that minimizes patch cord lengths. Provisions for cable management (organization of horizontal and vertical cable and patch cords) on the rack should be included.
- D. Horizontal cables to the classrooms will be directly connected to 110 insulation displacement hardware or equivalent associated with each jack on the patch panel. The jacks on the patch panel shall be wired in accordance with TIA/EIA 568- B.2 standard.

- E. Enhanced Category 6e, factory-built, manufacture tested patch cords shall be provided for each drop. Provide 10' patch cord at station end. For computer labs, provide 15' or 25' station cable patch cords. Provide 3' or 5' patch cord at rack end. (Length as required for electronics to properly lace cords). Patch cords shall be color coded for dedicated labs, media center, etc. Provide velcro patch cord wraps for cable management.
- F. Fiber Termination requirements:

Fiber optics connections should be terminated using a rack mountable Interconnect enclosure or equivalent to insure that the connections are protected. The enclosure should be locked and no fiber cable should be visible in the wiring closet (IC-X) or equipment room (MC).
- G. Acceptable Manufacturer's: Mod-Tap, Ortronics, AT&T, AMP, Hubbell, Interlink, Leviton, Panduit, and Siemon.

1.12 UNINTERRUPTIBLE POWER SUPPLY FOR NETWORK ELECTRONICS

- A. Not in Contract.

1.13 LOCAL AREA NETWORK (LAN) CABINETS AND RACKS SPECIFICATIONS

- A. Racks: Communications racks shall be UL listed 7N69. Wall mounted data rack shall consist of: (2) vertical rails, (2) base angles, (1) assembly hardware kit, (2) top angles, and (20) #12-24 dog. All rack design shall be a structural aluminum construction, having 3-inch (76 mm) wide vertical rail channels. Rack to be 19inch "NEXTFRAME" HPW series as manufactured by Hubbell-Premise, Inc. "C" Channel Vertical Cable Organizers and covers as scheduled. "Z" Channel Vertical Cable Organizers and covers.
- B. Acceptable equal Manufacturer are Mod-Tap, Ortronics, AT&T, AMP, Leviton, Interlink, Panduit, and Siemon.

1.14 SYSTEM DOCUMENTATION

- A. As part of the wiring system installation, the Contractor shall provide detailed documentation of the distribution system to facilitate system administration, system maintenance and future system changes. This requirement includes as-built drawings with all cables and terminations identified, a bill of materials of all installed equipment and wiring, rack and backboard equipment layouts showing placement of support equipment, and model and serial numbers of all installed equipment. A clear and consistent nomenclature scheme is to be defined and used on the documentation and cable labeling which facilitates locating and identifying each cable.
- B. System verification and acceptance documentation signed and dated by the installer (Contractor) and the design professional shall also be provided. This documentation shall include test measurements and system calibrations performed for the entire system. Sample system operations shall also be performed with actual hardware or using contractor provided test equipment and documented to verify that the system is operational and ready for acceptance. This shall also establish the baseline performance of the system.

1.15 TRAINING

- A. Training of owner's personnel (a minimum of two) shall be provided. Training will cover the location nomenclature, documentation structure and contents, documentation maintenance procedures, a "walk-through" for location and labeling orientation, system reconfiguration using the MC, and IC-X facilities (Termination hardware, punch blocks, etc.).
- B. Provide a record set plan noting drop locations and jack designations. As-built shall be a full size plan and shall be computer generated in AutoCAD 2012 format. Provide a CD to Owner with (as-built) on disc at project closeout. At each rack provide a copy of (as-built) mounted on wall. Mount plan under plexiglass.

END OF SECTION

DIVISION 26 - ELECTRICAL

SECTION 27 02 20 - COMMUNICATIONS CONSTRUCTION REVIEWS, INSPECTION, AND TESTING

1.01 GENERAL

- A. Comply with Division 1 - General Requirements.

1.02 CONSTRUCTION REVIEWS

- A. The Architect or his representative shall observe and review the installation of all electrical systems shown on the drawings and as specified herein.

1.03 CONTRACTOR'S FINAL INSPECTION

- A. At the time of the Contractor's final inspection, all systems shall be checked and tested for proper installation and operation by the Contractor in the presence of the Architect or his representative.
- B. The Contractor shall furnish the personnel, tools and equipment required to inspect and test all systems.
- C. Following is a list of items that the contractor must demonstrate to the Architect or his representative as complying with the plans and specifications. Please note that this list does not necessarily represent all items to be covered in the final inspection, but should give the Contractor an idea of what is to be reviewed.
 - 1. Demonstrate that all devices are properly secured to boxes, that device plates are properly aligned and are not being used to secure device.
 - 2. Demonstrate that Sound System is in proper working order, and meeting all requirements outlined in specifications.
 - 3. Demonstrate that Data/Voice Network cabling meets as testing and certifications as noted in section 270210.
 - 4. Demonstrate that Fire Alarm System is in proper working order, and meeting all requirements outlined in specifications.
 - 5. Demonstrate that Intercom System is in proper working order, and meeting all requirements outlined in specifications.

ELECTRICAL SYSTEMS CERTIFICATION

A. FIRE ALARM

1. Red-Lined "As-Builts" completed showing device addresses and O&M Manuals.
2. System Certification showing each device listed and tested.
3. Owner trained on operation and maintenance of system.

B. INTERCOM SYSTEM

1. Owner trained on operation and maintenance of system.

C. DATA/VOICE NETWORKING SYSTEM

1. Owner trained on operation and maintenance of system.

SIGNATURES

1. Richmond County Board of Education Media & Technology Services

2. Richmond County Board of Education Maintenance

3. GMK Representative

4. Electrical Design Consultants, Inc.

END OF SECTION