



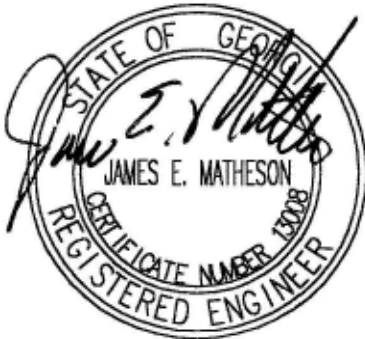
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WALKER COUNTY SCHOOLS HVAC MODIFICATIONS FAIRYLAND ELEMENTARY SCHOOL & CHEROKEE RIDGE ELEMENTARY

Walker County Schools, Lafayette, Georgia



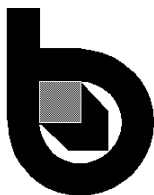
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ISSUED FOR BIDS

March 1, 2017

P R O J E C T M A N U A L



James W. Buckley & Associates, Inc.

423 Pine Avenue, Suite 200, Box 466

Albany, Georgia 31702

Phone: 229-883-4698 Fax: 229-883-0936

**PROJECT MANUAL
FOR
WALKER COUNTY SCHOOLS
HVAC MODIFICATIONS
FAIRYLAND ELEMENTARY SCHOOL &
CHEROKEE RIDGE ELEMENTARY**

Lafayette, Walker County, Georgia

OWNER:

Walker County Board of Education
201 South Duke Street;
PO Box 29
Lafayette, Georgia 30728
706-638-1240

ARCHITECTS

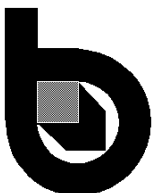
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Telephone (770) 751-0773
Fax (770) 751-9210

ELECTRICAL ENGINEER

Electrical Design Consultant
175 New St. Ste 1
Macon, Ga 31201
(478) 781-1833
Fax: (478) 781-1867



Project No. **206-17**
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P R O J E C T M A N U A L

T A B L E O F C O N T E N T S

**WALKER COUNTY SCHOOLS
HVAC MODIFICATIONS
FAIRYLAND ELEMENTARY SCHOOL &
CHEROKEE RIDGE ELEMENTARY
Lafayette, Walker County, Georgia**

THE CONTRACTOR IS REQUIRED TO COMPARE THIS PROJECT MANUAL WITH THE INDEX BELOW FOR COMPLETENESS. IF ANY PAGES ARE MISSING OR ILLEGIBLE IT IS HIS RESPONSIBILITY TO REQUEST REPLACEMENTS FROM THE ARCHITECT.

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NOT USED

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NOT USED

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**SECTION A
INVITATION TO BID**

A-01. Sealed bids from Contractors will be received by the Walker County Board of Education at 298 Culberson Avenue, LaFayette, GA 30728 until **2:00 PM**, local time, on **April 11, 2017** for the **Walker County Schools Hvac Modifications, Fairyland Elementary School & Cherokee Ridge Elementary**. The bids will be publicly opened and read. No extension of the bidding period will be made.

A-02. Bidding Documents may be reviewed and/or obtained at the office of James W Buckley & Associates, Inc., 423 Pine Avenue, Albany, GA 31701, phone (229) 883-4698, fax (229) 883-0936, or email rmb@jwbuckley.com. Electronic documents in .pdf format will be furnished to interested parties at no cost. The Bidding Documents are the property of the Owner.

A-03. The Contract, if awarded, will be on a lump sum basis to a responsive and responsible bidder. The Contract will be awarded by base bid. No Bid may be withdrawn for a period of sixty (60) days after date and time of opening, except as otherwise expressly provided by applicable law.

A-04. Each Bid must be accompanied by a Bid Bond (bond only; certified checks or other forms are not acceptable) in an amount not less than 5% of the Base Bid. Both a Performance Bond and Payment Bond will be required in amount equal to 100% of the Contract Price. By submitting a Bid, the Bidder agrees to sign the Owner's STANDARD FORM OF FIXED PRICE CONSTRUCTION CONTRACT, which is one of the Bidding Documents. The Owner reserves the right to reject any or all bids and to waive technicalities and informalities. The bids will be evaluated and awarded to what is most advantageous for the Walker County Board of Education.

A-05. There will be a mandatory pre-bid meeting will be held at **3:00 PM**, local time on **March 27, 2017** at 298 Culberson Avenue, LaFayette, GA 30728.

A-06. Each bid shall be submitted on the prescribed Form of bid. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures, and the certification shall be completed and executed when submitted.

A-07. Each bid must be accompanied with a **BID BOND** (Bond only; certified checks or other forms are not acceptable) in an amount equal to 5% of the base bid, payable to the OWNER and issued by a Surety authorized to do business in the State of Georgia, in order to guarantee that the bidder will enter into a contract to construct the project strictly within the terms and conditions stated in this bid and in the bidding and Contract Documents, should the construction contract be awarded to him.

A-08. The successful bidder shall be required to furnish a bond for the faithful performance on the contract and a bond to secure payment of all claims for materials furnished and/or labor performed in performance of the project, both in amounts equal to 100% of the Contract Price. Both bonds shall be issued by a Corporate Surety authorized to do business with the State of Georgia. All bids submitted shall remain open for a period of sixty (60) days after the date of the bid opening.

A-10. All bids submitted shall be in accordance with the terms of the Georgia Vendor Manual and the laws of the State of Georgia.

A-11. The owner reserves the right to reject any or all bids and to waive technicalities and informalities.

END OF SECTION A

**SECTION B
BID FORM**

to: Walker County Board of Education
201 South Duke Street;
PO Box 29
Lafayette, Georgia 30728
706-638-1240

For: Walker County Schools Hvac Modifications
Fairyland Elementary School &
Cherokee Ridge Elementary

Gentlemen:

B-01 BASE BID: Having carefully examined the plans and specifications entitled **Walker County Schools Hvac Modifications, Fairyland Elementary School &, Cherokee Ridge Elementary, Lafayette, Georgia** and the drawings similarly entitled, and enumerated on the Index of Drawings and dated **March 1, 2017**, and Addendum No.(s) _____ 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:

A. BASE BID

_____ Dollars
(\$ _____) which sum is herein after called the "Base Bid."

B-02 ALTERNATES: The following Alternate Prices are hereby established and subject to Owner approval: (1) may be incorporated into the Contract Price at the time of the award or (2) may form the basis of a Change Order. Said Alternate Prices shall remain in firm and in effect for sixty (60) days after Notice to Proceed is issued by the Owner. The Owner reserves the right to exercise/accept any combination of independent Alternates and adjust the Contract Price accordingly.

A. NONE

B-03 ALLOWANCES:

A. NONE

B-04 ACCEPTANCE: 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 Sixty (60) days following such time.

B-05 CONTRACT AWARD: The undersigned understands and agrees to, if a contract is awarded, it will be awarded based on Base Bid, financial stability, proof of ability to fully complete the project and complete the project on schedule. Upon Owner's request all information needed to prove contractor's ability to complete the project and complete it on schedule will be provided immediately.

B-06 CONTRACTS AND BONDS: In the event that the undersigned is notified in writing by mail, telegraph, or delivery of the acceptance of this proposal within sixty (60) days after the time set for the opening of bids, the undersigned agrees to execute, within twenty one (21) days, a contract for the Work for the above stated compensation and at the same time to furnish and deliver to the Owner a Performance Bond and Payment Bond in accordance with the forms provided in General Conditions of the specifications, both in an amount equal to 100% of the Contract sum. The surety shall be one which is licensed to do business in the State of Georgia.

1. The surety shall be one which is licensed to do business in the State of Georgia and shall have an A rating or better by A.M. Best Company and shall be currently listed on the U.S. Department of Treasury's Listing of Approved Sureties (Department Circular 570) as a surety authorized to write bonds for the U.S. Government.

B-07 COMMENCEMENT OF WORK: The undersigned agrees to commence actual physical work on the site with an adequate work force and equipment within ten days of the date of the Notice to Proceed and to complete fully all by no later than **July 27, 2017.**

- A. The contractor shall provide necessary materials, material delivery, including expedited shipment, and labor necessary to complete the project within the required time frame.
1. During the construction period the contractor shall have access to the site 7 days a week 24 hours a day.
 2. The contractor shall work hours necessary, including the working of multiple shifts, required to complete the work by the scheduled completion date.

B-08 BID BOND:

- A. 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 performance and payment bonds in case this proposal is accepted.
1. Provide surety bond only. Certified checks, cash or other forms of bid bond not acceptable.
 2. Bonding Company's standard form acceptable.
- B. If this proposal is accepted within 60 days after the date set for the opening of bids, and the undersigned fails to execute the Contract within twenty one (21) days after notice of such acceptance or if he fails to furnish both performance and payment bonds, the obligation of the bid bond will remain in full force and effect and the money payable thereon shall be paid into the funds of the Owner as liquidated damages for such failure; otherwise, obligation of the bond will be null and void.

B-09 CERTIFICATION: In Submitting this Proposal, the Bidder certifies that provisions of the Act entitled "State Employees and Officials Trading with The State of Georgia", Georgia Laws 1956, pp. 60 et. seq., has been complied with.

B-10 QUALIFICATIONS: The bidder submits the following statement of bidder's qualifications.

B-11 The bidder submits the following statement of bidder's qualifications for consideration by the Owner.

Legal Name of Bidder _____
as Registered With the Secretary of State

Business Address _____

When Organized _____ State Incorporated _____ Type _____
Corp., Partnership, Sole Proprietorship

Georgia Resident: YES _____ NO _____

Federal I.D. No. _____ or Social Security No. _____

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

Financial Statement: Working Capital _____ Net Worth _____ Date: _____

Credit Available for this Contract \$ _____

Contracts now in hand, Gross Amount \$ _____

Have you ever refused to sign a contract at your original bid? _____

Have you ever been declared in default on a contract? _____

Please check the box if the definition below applies to your company. ()

Minority Business Enterprise (MBE) - The business is either: a) owned by a member of a minority race or b) a partnership of which a majority interest is owned by one or more members of a minority race or c) a public corporation of which a majority of the common stock is owned by one or more members of a minority race. A member of a minority race is defined as an individual who is a member of a race which comprises less than 50 percent of the total population of the State of Georgia. This request is made for statistical purposes only.

B-12 I certify that I am a principal or other representative of the firm submitting this bid and that I am authorized by it to execute the foregoing offer on its behalf. I am a principal person of the foregoing with management responsibility for the foregoing subject matter and as such I am personally knowledgeable of all its pertinent matters.

B-13 I certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm or person submitting a bid for the same materials, supplies, or equipment, and is in all respects fair and without collusion or fraud. I understand collusive bidding is a violation of State and Federal law and can result in fines, prison sentences and civil damage awards. I agree to abide by all conditions of this bid and certify that provisions of Georgia O.C.G.A. Section 45-10-20, et.sec., have not and shall not be violated in any respect.

Respectfully submitted,

Firm Name: _____
LEGAL NAME OF BUSINESS

Address: _____ LEGAL BUSINESS
ADDRESS (P.O. BOX IS INSUFFICIENT)

CITY STATE ZIP

MAILING ADDRESS IF DIFFERENT FROM ABOVE

Telephone Number: _____
AREA CODE NUMBER

BY: _____
Authorized Signature (BLUE INK PLEASE)

Typed/Printed Name Title

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

(1) _____
Check One: President () Partner () Owner ()

(2) _____
Check One: Vice President () Secretary () Partner ()

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

NOTICE TO BIDDERS

- 1) **MAKE SURE YOU HAVE SIGNED THIS PROPOSAL IN THE SPACE PROVIDED ABOVE.**
- 2) **SUBMIT ORIGINAL AND ONE COPY OF THE FORM OF PROPOSAL.**
- 3) **MAKE SURE YOU AND YOUR SURETY HAVE PROPERLY EXECUTED THE BID BOND.**

**SECTION D
SUPPLEMENTARY GENERAL CONDITIONS**

1.01 GENERAL CONDITIONS

- A. Section "E", General Conditions, Articles E-01 to E-71, are a part of this Contract.

1.02 SUPPLEMENTS

- A. The following supplements modify, delete and/or add to the General Conditions. Where any article, paragraph or subparagraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such article, paragraph, or subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any article, paragraph, or subparagraph in the General Conditions is amended, voided, or superseded by any of the following paragraphs, the provisions of such article, paragraph or subparagraph not so amended, voided, or superseded shall remain in effect.
- B. **Article E-01:** Delete this paragraph.
1. Where a conflict exists between the requirements of the general conditions to the specifications and the technical provisions of the specifications the more stringent of the requirements shall govern. In cases where the conflict is not an issue of stringency or scope, the requirements of the technical specifications shall govern.
 2. Form of Agreement; Severability: In the event that any one or more of the provisions contained herein shall, for any reason, be held to be invalid, illegal or unenforceable in any respect, such invalidity, illegality or unenforceability shall not affect any other provisions of this agreement, but this agreement shall be construed as if such invalid, illegal or unenforceable provisions had never been contained herein.
- C. **Article E-4 - Copies of Contract Documents; Change** to read:
1. Electronic-.pdf formatted documents will be furnished to bidders free of charge.
 2. Hard copies of contract documents will furnished to requesting parties at actual cost of reproduction, postage and 25% handling fee.
- D. **Article E-5 - Shop Drawings:**
1. Delete paragraph (d).
 2. Add the following:
 - '(d) Complete shop drawings required for all products specified.'
 - '(e) The contractor shall review, approve and submit, with reasonable promptness, and in such a sequence as to cause not delay in the Work or the Work of the Owner or separate contractor, all shop drawings, product data, and samples required by the contract documents.'
 - '(f) By approving and submitting Shop Drawings, Product Data, and Samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, and that he has checked and coordinated the information contained within such submittals with the requirements of the work of the Contract Documents'
 - '(g) No portion of the Work requiring submission of Shop Drawings, Product Data, or Samples shall be commenced until the submittal has been reviewed by the architect and noted, by the Architect on the Shop Drawing or on a cover sheet attached to the Shop Drawing as 'Reviewed' or 'Reviewed with comments'
- E. **Article E-11 - Surveys, Permits and Regulations:** Paragraph (a): Permits: Per Georgia Code 20-2-261(d) a Local Board of Education shall be exempt from county and municipal assessments and fees for county and municipal permits and inspections and exempt from county and municipal impact fees.
1. County building permits and impact fees to be excluded from the contractors bid or proposal.

- F. **Article E-12 - Protection of Work and Property:** Add the following:
1. The Contractor shall sole responsibility for and will have control of construction means, methods, techniques, sequences, procedures, and for safety precautions and programs in connection with the work.
 2. The contractor is solely responsible for selecting methods and implementation of selected methods utilized to protect existing facilities, new and existing site features and improvements, new construction and other work of this contract as required to prevent damage to these elements fore the duration of the contract.
 3. Where existing or new site features and improvements and/or building features or construction are damaged as a result of failure to implement necessary protection, the contractor shall be responsible for the repair and/or replacement of the element(s) damaged without additional cost to the contract.
- G. **Article E13 - Inspection of Work:** Paragraph (b) add the following:
- '(1) The architect shall be allowed to view, prior to covering of concealing, all underground or concealed work.'
 - '(2) Prior to covering the underground or concealed work the contractor shall notify the architect in writing, no less than 48 hours in advance of the time that the work is to be covered, that the work is ready for viewing by the architect/engineer.'
 - '(3) If any portion of the work should be covered contrary to the request of the Architect or to the requirements specified in the contract documents, it must, if requested by the architect in writing, be uncovered, for his observation. Removal and replacement of construction required shall be at the contractor's expense.'
- H. **Delete Article E-14 and substitute the following:**
1. Article E-14 - Superintendence and Supervision by Contractor.-
 - a. **Superintendent of Contractor.**-The Contractor shall keep on his work during its progress and until the final certificate has been executed by the Architect a competent superintendent and any necessary assistants, all satisfactory to the Architect. The Contractor's Superintendent shall have at least five (5) years experience as Superintendent on projects of similar scope and complexity as this project and shall have been the Superintendent on at least one facility that includes requirements comparable to this facility.
 - 1) The project superintendent shall be on site at all times when work under this contract is being performed by any person or contractor (subcontractors) employed by the General Contractor or Sub Contractor(s). No unsupervised (by General Contractor's Superintendent) work by subcontractors, tradesmen or employees will be permitted.
 - 2) The project superintendent shall be on site, as a minimum, five days a week, eight hours a day. This shall be considered to be an absolute minimum. In addition to these hours the superintendent shall be on site at any time work is being performed by employees of the contractor or employees of subcontractors, vendors, suppliers or other parties working under the General Contractor's contract.
 - b. **Project Manager of the Contractor.**- If the Contractor performs his duties with the assistance of a Manager, the Project Manager shall have at least five (5) years experience as Project Manager on projects of similar scope and complexity as this project and shall have be the Project Manager on at least one facility that includes systems comparable to this project.
 - c. **The Superintendent nor the Project Manager** shall not be changed except with the consent of the Architect unless the either proves to be unsatisfactory to the Contractor and ceases to be in his employ. The Superintendent or the Project Manager shall represent the Contractor in his absence, and all directions given to either of them shall be as binding as if given to the Contractor. [See also Articles E-9, E-12, E-15(c), and E-60]
 - d. **The Contractor** shall, within seven days after notification of award of contract, submit name of proposed Project Superintendent an, if applicable, name of Project Manager with two references that can verify experience. Name the facilities required in (a) and (b) above with the names and telephone numbers of Owner and Design Professionals that can that can verify information. Approval of the Project Superintendent and, if applicable Manager by the Architect required prior beginning of construction on the Project. If initial submissions are rejected by Architect, Contractor will submit other candidates for such positions until acceptable to Architect.

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

I. **Article 15** -Changes in the Work;

- 1. Paragraph (f); Rock:
 - a. Paragraph (2); Rippable Rock: Delete this paragraph.
 - b. Paragraph (3); Trench Rock: Trench rock shall be further defined as that rock which is encountered in the excavation of trenches. Trench rock shall not apply to conditions where rock is encountered in mass removal conditions.
 - c. Refer to technical sections for definitions of rock. Provisions of this section (General Conditions) only apply if rock is not defined in other sections of the contract documents.
- 2. Paragraph (g), Costs to Owner, Allowances for Contractor, and Allowable Expenditures:
 - a. Expenses **not** eligible for reimbursement to be expanded to include: administrative costs including personnel, project management costs including personnel, home office expenses, extended home office and project overhead costs, costs associated with development of or revisions to shop drawings, engineering, drafting, mobilization and/or re-mobilization, and travel.
- 3. Paragraph Entitled 'Cost to Owner, Allowances for Contractor, And Allowable Expenditures':
 - a. Paragraphs (1) and (2): Change 20% overhead and profit to 15% overhead and profit.

- J. **Article 18** - Delays and Extensions of Time: Paragraph (a); Change the last sentence to from '...Contractor's sole remedy for such delay shall be an extension of contract time and that the Contractor shall make no demand for damages or extended overhead.' to '...Contractor's **sole** remedy for such delay shall be an extension of contract time. The Contractor shall not be entitled to and shall not make demand for payment for damages, extended overhead, extended home office expenses, mobilization or re-mobilization, equipment rental, personnel costs, or other costs associated with the delay.

K. **Article 18** - Delays and Extensions of Time: Add the following to Paragraph (e):

- '(e) The listing below defines the monthly anticipated adverse weather days for the contract period and is based upon NOAA (National Oceanic and Atmospheric Administration), NWS (National Weather Service), or similar data for the geographic location of the project.

MONTHLY ANTICIPATED ACTUAL ADVERSE WEATHER (CALENDAR DAYS)

January.....7	May.....4	September.....4
February6	June.....3	October.....3
March.....5	July.....4	November.....3
April.....4	August.....4	December.....6

- 1. General: The above schedule of anticipated adverse weather days shall constitute the base line for monthly (or portion thereof) weather time evaluations. Upon acknowledgment of the Proceed Order and continuing throughout the contract on a monthly basis, the Contractor shall record the actual adverse weather days at the work site on a calendar day basis (including scheduled work days on weekend and holidays) and compare the actual adverse weather days to the Monthly anticipated adverse work days listed above.
- 2. Definition of Adverse Weather Days: For the purpose of determining extensions in the contract time the following shall be the definition of adverse weather days:
 - a. For purpose of this subparagraph, the term "actual adverse weather days" shall only include days the work was impacted by adverse weather. Adverse weather occurring on a day which is not a scheduled work day will not be considered an actual adverse weather day.
 - b. Adverse weather days shall be those days on which the scheduled work cannot be performed due to weather conditions (rain, snow or ice only) **and** when the amount of rain fall exceeds 0.20" or snow and sleet exceed 4" from 8:00 A.M. to 5:00 P.M. on scheduled work days. Cold weather shall not be considered an adverse weather day.

- a. Adverse weather days shall include only those days on which the event (rain, snow, or ice) occurs and shall not include days subsequent to the event.
 - b. Extensions in time shall not be granted for adverse weather days occurring prior to the physical commencement of construction or after the date by which the building was scheduled to be dried-in (roofing, siding and walls in place to the extent that the building is protected from rainfall) on the initial base line schedule.
 - c. Should the project fall behind the Contractor's original base line construction schedule, no extensions will be given for inclement weather days beyond the initial scheduled dry-in date plus any additional days due Contractor during such originally scheduled period.
 - d. Adverse weather days shall not be allowed for days on which adverse weather occurs when the contractor has failed to implement appropriate measures to minimize the effect of adverse weather on the progress of the project.
2. Contractor's Base Line Schedule:
- a. The Contractor's construction schedule shall reflect the above anticipated adverse weather delays on all weather dependent activities. The number of adverse weather days shall be as defined in the table above.
 - b. No adjustments in contract time will be considered if the initial schedule does not include the required number of adverse weather days built into the schedule.
3. Prerequisites for Request for Adjustments to Contract due to Adverse Weather: Prior to requesting adjustment to the contract time due to adverse weather the contractor shall develop and submit to the architect certain documents noted below. Failure to provide the required back up data will subject the request to rejection. Documents to be furnished to the architect include:
- a. Contractor's daily reports clearly indicating the adverse weather conditions, including type of adverse weather (rain, snow or sleet), the amount of rainfall and the time that the rainfall occurred. The use of regional or climatological data from off-site sources will not be considered adequate support for extensions in time.
 - b. Contractor's daily reports clearly indicating the work underway at the time of the adverse weather and the impact that the adverse weather had on the activity.
 - c. A tabulation showing the actual adverse weather days compared the anticipated adverse weather days defined above.
 - d. Documentation showing that the contractor has implemented steps to mitigate the effects of unusually severe weather in compliance with the provisions of ARTICLE E-12(E), PROTECTION OF WORK AND PROPERTY of the GENERAL CONDITIONS.'
4. Calculation of Adverse Weather Days: The contractor shall submit, on a monthly basis, a tabulation of the number of adverse weather days occurring on site. The number of actual adverse weather days shall be measured chronologically from the first to the last day in each month.
5. Requests for Adjustments to the Contract:
- a. The contractor shall submit a written requests for adjustments to contract time on a monthly basis, Such requests shall include required supporting documentation as described herein.
 - b. Adjustments to Contract Time: The architect will review such request to determine if and adjustment in time is due. If the number of actual adverse weather days differs from the anticipated adverse weather days, the contract time period will be adjusted (either increased or decrease) the appropriate number of days. Adjustments to the contract time will be included in a 'no-cost' change order.
 - c. Adjustments in Contract Amount: No changes in the contract sum will be due or authorized due to adjustments of contract time due to weather.
- B. **Article E-21 - The Owner's Right to Do Work:** Add the following paragraph:
1. If in the opinion of the Architect, it is evident that the contractor has not completed or will not be able to substantially complete the work in accordance with the contract documents, due to default, negligence, or failure on the part of the contractor, or their subcontractors, the Owner may issue to the contractor a written notice to commence and continue correction of such defaults or neglects with diligence and promptness within a 48-hour period. If the contractor fails to correct such deficiencies within the first notice period, the Owner may issue a second 48-hour written notice to the contractor. If the contractor, within such 48-hour period after receipt of such second notice fails to commence and continue to correct any deficiencies, the Owner may, at his option, without prejudice, complete certain portions of the work as may be necessary, or augment the forces of the contractor with additional manpower as may be required to complete the work by the contracted completion date. In such case, an appropriate deductive change order shall be written, deducting from the contract price the actual costs incurred by the Owner to complete or

augment the work including compensation for the Architect's additional services and expenses made necessary by such default, neglect or failure. Furthermore, if payments then or thereafter due the contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. Such amounts charged to the contractor shall be subject to the approval of the Architect. Such actions, if taken by the Owner shall not be interpreted by the Contractor as a termination of the Contract, and the contractor is to continue to carry out the work or portion of the work as may be required by the contract during this time frame.

C. **Article E-24 - Application for Payments:**

1. Provide separate pay requests for each project. Individual pay requests will be required for:
 - a. Fairyland Elementary School
 - b. Cherokee Ridge Elementary School
2. Refer to paragraph (b) Initial Breakdown and Periodical Payments:

"If payments are made on valuation of work done, such application shall be submitted at least fifteen days before each payment falls due, ..."

 - a. Delete "fifteen days" and in lieu thereof supply "thirty days".
 - b. Provisions of this Article are intended to supersede provisions of Prompt Pay Act.
 - c. The time period for payment shall start from the date of the approval by the architect.
3. Applications for payment shall be to the architect on or before the first day of the month.
4. Modify the requirements of this Section as defined in 'Attachment A' located at the end of this section.
5. Applications for Payment shall be notarized by the General Contractor submitting the application
6. Initial Pay Request: The initial pay request shall not be authorized until each of the following documents has been submitted and found to comply with the requirements of the contract documents:
 - a. Fully executed Owner/Contractor contract.
 - b. Required insurance certificates
 - c. Contractor's performance and payment bonds
 - d. Sub contractor's performance and payment bonds where required
 - e. Complete schedule of values (detailed cost breakdown)
 - f. Initial base-line schedule
7. Periodic Pay Requests: The monthly pay requests shall not be authorized until each of the following have been submitted and found to comply with the provisions of the contract requirements:
 - a. Updated project schedule
 - b. Lien Waiver and Release; Exhibit B, Attached hereto
8. Pay Requests; Project Closeout Process:
 - a. Unless otherwise agreed upon by the Owner and Architect, in writing, the contract retainage shall not be reduced until the contract work, including punchlist work and closeout documents, have been fully completed.
 - b. The contract retainage may, at the Owner/Architect's option, be reduced prior to the completion of the work. If the retainage is reduced the following conditions shall apply:
 - 1) The contractor shall submit to the architect a statement from the contractor's surety agreeing to the reduction of the retainage.
 - 2) The punchlist shall have been completed to the extent that the majority of the items identified on the punch list, as determined by the architect, have been completed and/or corrected.
 - 3) Work identified on orders of condemnation and notices of non-compliance have been corrected.
 - 4) All requested change order proposals, including those for credits due, have been submitted and costs have been found to be acceptable.
 - 5) Non-compliant and/or incomplete work: The value of the retainage shall be established by the architect by assigning values to each punch list item and doubling the sum of the value of the items. The minimum value of each item on the punch list shall be \$100.00. The value assigned to item by the each architect is final and not subject to debate.
 - 6) Close Out Documents: An amount equal to .25% of the contract amount or \$25,000, which ever is greater shall be retained until all of the required close out documents have been received. Close out documents include, but not limited to: As-built drawings, as-built survey, videos of sewers, record shop drawings, warranties, affidavits, operation and maintenance manuals, product data, videos of training sessions, attic stock as well as other specified activities and documents. Should complete close out documents not be received within the time frame allowed by the contract documents the amount defined above shall be deducted from the contractor's final payment.

9. It shall be understood that the Owner shall make progress payments on account of the contract for 90% (10% will be retained) of the value, based on the contract prices, including Owner approved and signed change orders, of labor and materials incorporated in the work and of materials suitably stored at the site thereof, as estimated by the Architect, less the aggregate of previous payments, until one-half (50%) of the contract sum is due (including all Owner approved and signed change orders) and provided that:
 - a. The work is not behind schedule as determined, by the Architect only, from the Architect approved, time scaled CPM schedule with monthly anticipated progress payment amounts submitted at or before the pre-construction meeting;
 - b. The work is being performed in a satisfactory manner in compliance with the contract document as determined by the Architect;
 - c. There are not outstanding claims or liens on the property; (Contractor shall submit, with pay request, a lien release form for each subcontractor requesting payments. See Exhibit B.)
 10. Further payments, with total compliance of 8a., 8b., and 8c. shall be made in the amount of 100% of the value of the labor and/or materials incorporated in the work and of materials suitably stored at the site thereof unless:
 - a. The percentage of work complete falls behind the percentage required by the construction progress schedule, as described in 8a. by as much as 10%; or
 - b. The work is being performed in an unsatisfactory manner and/or non-compliant with the contract documents as determined by the Architect; or
 - c. There are outstanding claims or liens on the property.
 11. In which event or events, the Owner shall reinstate the 10% retainage on all periodical payments to be paid while one or more of the events continues to exist. The Contractor shall be given written notice, by the Architect, of the reinstatement of the retainage. If the Contractor's actual progress becomes more than 10% behind the Contractor's anticipated progress, as described in 8a., the Owner may direct the withholding of payments to the contractor in amounts equal to the percentage behind the Contractor's anticipated progress, in addition to the 10% described in all Items of Article 24.
 12. If the Contractor recovers all lost time and puts the work back on schedule (0% behind schedule) per schedule described in 8a. and remedies all breaches of 9b. and 9c, further payments shall be as described in 10.; unless Items 8a., 8b., and 8c. recur in which event or events the Owner shall reinstate paragraph 7.
 13. No reduction in retainage shall be incorporated as an automatic in the contract. Any reduction in retainage shall only be considered on a job-by-job basis by the condition of the project at the time of issuance of the Certificate of Substantial Completion. No additional reduction in retainage will be allowed beyond that amount agreed to at the time of Substantial Completion. The Owner will not release remaining funds until the punch list is complete, and all required close-out documentation has been reviewed, accepted and turned over to the Owner.
- D. **Article E-25** Certificates Of Payments:
1. Sub Paragraph "d": Change "legal rate in force at building" to "7% Per Year"
 2. Provisions of this Article are intended to supersede provisions of Prompt Pay Act.
- E. **Article E-27;** Insurance and Hazards: Change Limit Amounts to the Following:
1. Owner's Protective Liability:
 - a. Bodily Injury:
 - 1) Each occurrence: \$1,000,000
 - 2) Aggregate: \$2,000,000
 - b. Property Damage:
 - 1) Each occurrence: \$1,000,000
 - 2) Aggregate: \$2,000,000
 2. Contractor's Protective and Public Liability - Occurrence Basis:
 - a. General Aggregate: \$2,000,000.
 - b. Product & Completed Operations Aggregate: \$2,000,000.
 - c. Persons & Adv. Injury: \$1,000,000.
 - d. Each Occurrence: \$1,000,000.
 - e. Fire Damage (one Fire): \$ 50,000.
 - f. Medical Expenses (one Person): \$ 5,000.

- F. **Article E-27; Insurance and Hazards; Add the following:**
1. Contractual Liability Insurance (Hold Harmless).
 - a. Bodily Injury:
 - 1) Each occurrence : \$1,000,000
 - b. Property Damage:
 - 1) Each occurrence: \$1,000,000
 - 2) Aggregate: \$2,000,000
 2. Comprehensive auto:
 - a. Combined Single Limit: \$1,000,000
 3. Excess Liability (Umbrella Form):
 - a. Each Occurrence: \$1,000,000
 - b. Aggregate: \$1,000,000
 4. Workers Compensation and Employers Liability:
 - a. Limits: Statutory Limits, but not less than the following:
 - 1) Each Accident: \$1,000,000.
 - 2) Disease Policy Limit: \$ 500,000.
 - 3) Disease, Each Employee: \$ 100,000.
 5. Products and completed operations insurance shall be maintained for a minimum of period of two years after final payment.
 6. Property damage liability insurance shall include coverage for the following hazards:
 - a. Explosion
 - b. Collapse
 - c. Underground
- G. **Article E-27; Builder's Risk (fire and extended coverage) Insurance:**
1. The Builder's Risk Insurance shall be payable to the Contractor and the Owner, as their interests may appear, for the full amount of the Contract covering as a minimum fire, extended coverage, vandalism, and malicious mischief. The Contractor and the Owner shall be named in the policy or policies as an insured.
 2. Builder's Risk Insurance Policies shall furnish coverage at all times for the full cash value of all completed construction (work in place), materials in place and/or stored at the site, foundations, and equipment in or adjacent to the Building or Buildings which are to be made a part of the Builder's Risk Insurance, whether or not the partial payment has been made by the Owner.
 3. The Contractor may terminate this insurance on buildings covered as of the date said buildings are occupied by the Owner.
 4. All insurance shall be carried with companies which are financially responsible. If any such insurance is due to expire during the construction period, the Contractor shall not permit coverage to lapse and shall furnish evidence of Coverage to the Owner.
 5. All of the above Insurance/Bonding costs shall be furnished and paid for by the Contractor for the duration of the contract, and the cost of the premiums shall be included in the proposal.
- H. **Article E-28. Affidavits:** Add the following:
1. Prior to commencing work the contractor shall execute, and deliver to the Owner and Architect the attached 'Contractor Affidavit'
- I. **Article E-38. Architect:** Add the following:
- (d) The architect will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the work, and he (she) will not be responsible for the Contractor's failure to carry out the work in accordance with the Contract Documents. The Architect will not be responsible for or have control or charge over the acts or omissions of the Contractor, Subcontractors, or any of their agents or employees, or any other persons performing any work on this project.
- J. **Article E-70; Utilities:**
1. For additional requirements refer to Section 01 5000, Temporary Facilities.
 2. Where conflicts exist between the General conditions and Section 01 5000, the provisions of Section 01 5000 shall govern.

- K. **Delete** the following Articles in the General Conditions:
1. E-29 Bond on Roof and Walls
 2. E-57 Cash Allowances
 3. E-58 Testing Services
 4. E-59 Drilling and Log of Drilling Wells

END SECTION D

**ATTACHMENT
EXHIBIT "A"**

Section 1. Article 1 of Chapter 10 of Title 13 of the Official Code of Georgia Annotated, relating to general provisions affecting contracts for public works, is amended by adding at the end of said article a new Code section, to be designated as Code Section 13-10-2, to read as follows:

Code Section 13-10-2:

- (a) As used in this Code section, the term:
- (1) "Contractor" means a person having a direct contract with the Owner.
 - (2) "Lower tier subcontractor" means a person other than a contractor having a direct contract with a subcontractor.
 - (3) "Owner" means the state, any county, municipal corporation, authority, board of education, or other public board, public body, department, agency, instrumentality, or political subdivision of the state.
 - (4) "Owner's authorized contract representative" means the architect or engineer in charge of the project for the Owner or such other contract representative or officer as designated in the contract documents as the party representing the Owner's interest regarding administration and oversight of the project.
 - (5) "Subcontractor" means a person other than an Owner having a direct contract with the contractor.

- (b) In any contract for the performance of any construction project entered into on or after July 1, 1985, with an Owner, as defined in paragraph (3) of subsection (a) of this Code section, such contract shall provide for the following:

After work has commenced at the construction site, progress payments to be made on some periodic basis, and at least monthly, based on the value of work completed as may be provided in the contract documents plus the value of materials and equipment suitably stored, insured, and protected at the construction site, and at the Owner's discretion such materials and equipment suitably stored, insured, and protected off site at a location approved by the Owner's authorized contract representative when allowed by the contract documents, less retainage; and

- (1) Retainage to a maximum of 10 percent of each progress payment; provided, however, that when 50 percent of the contract value including change orders and other additions to the contract value provided for by the contract documents is due and the manner of completion of the contract work and its progress are reasonably satisfactory to the Owner's authorized contract representative, the Owner shall withhold no more retainage. At the discretion of the Owner and with the approval of the contractor, the retainage of each subcontractor may be released separately as the subcontractor completes his work.
- (2) If, after discontinuing the retention, the Owner's authorized contract representative determines that the work is unsatisfactory or has fallen behind schedule, retention may be resumed at the previous level. If retention is resumed by an Owner, the contractor and subcontractors shall be entitled to resume withholding retainage accordingly.

- (3) At substantial completion of the work or such other standard of completion as may be provided in the contract documents and as the Owner's authorized contract representative determines the work to be reasonably satisfactory, the Owner shall within 30 days after invoice and other appropriate documentation as may be required by the contract documents are provided pay the retainage to the contractor. If at that time there are any remaining incomplete minor items, an amount equal to 200 percent of the value of each item as determined by the Owner's authorized contract representative shall be withheld until such item or items are completed. The reduced retainage shall be shared by the contractor and subcontractors as their interests may appear.
- (4) The contractor shall, within ten days from the contractor's receipt of retainage from the Owner, pass through payments to subcontractors and shall reduce each subcontractor's retainage in the same manner as the contractor's retainage is reduced by the Owner, provided that the value of each subcontractor's work complete and in place equals 50 percent of his subcontract value, including approved change orders and other additions to the subcontract value and provided, further, that the work of the subcontractor is proceeding satisfactorily and the subcontractor has provided or provides such satisfactory reasonable assurances of continued performance and financial responsibility to complete his work including any warranty work as the contractor in his reasonable discretion may require, including, but not limited to, a payment and performance bond.
- (4) The subcontractor shall, within ten days from the subcontractor's receipt of retainage from the contractor, pass through payments to lower tier subcontractors and shall reduce each lower tier subcontractor's retainage is reduced by the contractor, provided that the value of each lower tier subcontractor's work complete and in place equals 50 percent of this subcontract value, including approved change orders and other additions to the subcontract value and provided, further, that the work of the lower tier subcontractor is proceeding satisfactorily and the lower tier subcontractor has provided or provides such satisfactory reasonable assurances of continued performance and financial responsibility to complete his work including any warranty work as the subcontractor in his reasonable discretion may require, including, but not limited to, a payment and performance bond.
- (c) This Code section shall not apply to:
 - (1) Any contracts let by the Department of Transportation of this state for the construction, improvement, or maintenance of roads or highways in this state or purposes incidental thereto: or
 - (2) Any contracts whose value or duration at the time of the award does not exceed \$150,000.00 or 45 days in duration.
- (d) Contract and subcontract provisions inconsistent with the benefits extended to contractors, subcontractors, and lower tier subcontractors by this Code section shall be unenforceable; provided, however, that nothing in this Code section shall render unenforceable any contract or subcontract provisions allowing greater benefits to be extended to such contractors, subcontractors, or lower tier subcontractors, the provisions and benefits of this Code section being minimal only.
- (e) Nothing shall preclude a payor under this Code section, prior to making a payment, from requiring the payee to submit satisfactory evidence, including but not limited to all and/or any invoices, that all payrolls, material bills, and other indebtedness connected with the work have been paid.

In addition to the foregoing , before the Owner can implement the above amendment to the contract, a letter of consent from the Surety Company must be provided to the Owner ten (10) days prior to the contractor's request to the Owner to withhold no more retainage under the terms of Exhibit "A."

END OF EXHIBIT "A"

EXHIBIT B

LIEN WAIVER AND RELEASE

Person/Company Supplying the Work or Improvement

Name of Project: _____

Project Address: _____

Name of Owner: _____

ACKNOWLEDGMENT AND RELEASE FOR PRIOR PAYMENTS RECEIVED

The undersigned hereby acknowledges that the undersigned has received prior payments(s) for labor/services/equipment and/or material furnished to the above-designated project through _____, 20____ and does hereby release pro tanto any mechanic's lien, stop notice, equitable lien or labor and material bond rights that the undersigned has to the above extend only and does not cover any retention of items furnished after that date. This release is for the benefit of and may be relied upon by the owner, the prime contractor, the architect, and the principal and surety on any labor and material bond posted for the project.

NOTICE: THIS DOCUMENT WAIVES RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGNED, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL RELEASE FORM.

Date: _____

Title: _____

END OF EXHIBIT "B"

CONTRACTOR'S AFFIDAVIT

(This form is to be executed in compliance with the Official Code of Georgia Annotated Section 36-91-21(e). If the contractor is a partnership, the Affidavit shall be executed by all partners and any officer, agent, or other person who may have represented or acted for them in bidding for or procuring the contract. If the contractor is a corporation, all officers, agents, or other persons who may have acted for or represented the corporation in bidding for or procuring the contract shall execute the affidavit.)

STATE OF GEORGIA, COUNTY OF _____

_____, being duly sworn, hereby deposes and says
(Insert Name of Affiant)

that he/she has read, and is familiar with, the provisions of the official Code of Georgia Annotated Section 36-91-21(d) which provides as follows:

Whenever a public works construction contract for any governmental entity subject to the requirements of this chapter is to be let out by competitive sealed bid or proposal, no person, by himself or herself or otherwise, shall prevent or attempt to prevent competition in such bidding or proposals by any means whatever. No persons who desires to procure such work for himself or herself or for another shall prevent or endeavor to prevent anyone from making a bid or proposal therefor by any means whatever, nor shall such person so desiring work cause or induce another to withdraw a bid or proposal for work.

And that he/she has not directly or indirectly violated said provisions of the law.

Further, Affiant saith not.

This _____ Day of _____, 20_____.

Sworn to and subscribed before me this _____ Of _____ 20_____.

(Notary Public)

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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 [NAME OF Owner], Owner".

Article E-02. Drug-Free Work Place Act.-The Contractor Acknowledges that he is fully aware of the contents and requirements of Chapter 24 of Title 50 of the Official Code of Georgia. The Contractor, upon submission of a proposal in connection with this contract, does hereby certify that he and his subcontractors are in compliance with the aforesaid code section.

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 bidding documents, application for the approval of the use of such products must reach the hands of the Architect at least ten days prior to the date set for the opening of bids. The latter provision is a restriction which applies only to the party making a submittal. Therefore, the aforesaid restriction does not inhibit the 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 material or equipment submitted for consideration differ from the material or equipment designated in the bidding 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 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.

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 also Article E-71 for specimen of form of agreement] [See also Article E-30]

(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) *Work Included.*-Contractor shall provide all labor, materials and equipment necessary to completely and properly supply and install, in proper operating condition, the products specified in each individual section or shown on the drawings, unless specifically indicated to be supplied and/or installed by the Owner.

(g) *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]

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

(i) *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]

(j) *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]

(k) *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.

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

(m) *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 (i) 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. The change order form shall be signed by the Contractor and the Owner. The breakdown is only for the purpose of enabling the Architect and the Owner to make a judgment on the dollar amount of the adjustment in the contract sum. No condition, term, qualification, limitation, exception, exemption, modification, or proviso shall appear in the breakdown. The breakdown shall be in the exact form and language of the above-mentioned specimen. In the event any condition, term, qualification, limitation, exception, exemption, modification, or proviso shall appear in a breakdown it shall be invalid unless expressly recited in the change order form under Paragraph 3, "Description of Change". Only such conditions, terms, qualifications, limitations, exceptions, exemptions, modifications and provisos as are recited under Paragraph 3, "Description of Changes", are valid. [See also Article E-15]

(n) *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.

(o) *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.

(p) *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* grounds for issuance of a notice of declaration of default under the performance bond of 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 the delinquency. The Architect does not have authority to declare the Contractor in default.

(q) *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.

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

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 meanings. [See also Article E-9] In the event the Architect shall have used such phrases anywhere in the Contract Documents as: "Work indicated on the drawings and herein specified", "work shown and specified", "in accordance with drawings and specifications", "indicated on the drawings and specifications", "in accordance with specifications and applicable drawings", "these specifications and the accompanying drawings", as indicated on the drawings and as specified herein", or similar expressions, they shall not be deemed to be and are not a defeasance of the provisions under the present article of the general conditions, and they are not to be construed as requiring work to be called for both in the specifications and in the drawings in order to be a requirement under the contract. Any of the aforesaid conjunctive expressions and phrases or any cross-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]

(c) *Examination.*-Before submitting proposals, bidders shall examine all drawings and specifications and shall be fully informed as to the extent and character of the work required by the Contract Documents. Consideration will not be granted for alleged misunderstanding of the materials to be furnished or the work to be performed; it being understood that the tender of a proposal carries with it the agreement to all items and conditions referred to throughout the project manual (specifications) and/or the drawings.

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 Article 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 development thereof, and reasonable 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 Article E-16 and E-39]

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

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

Article E-5. Shop Drawings.-

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

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

(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]

(d) *Drawings and Details.*-It is the intent that the project be built in accordance with the Architect's drawings and specifications, therefore, submissions of plans and details of items the Architect's drawings have shown are not required. However, if actual or anticipated job conditions, manufacturer's recommendations, or other reasons approved by the Architect, require that the installation be other than as the Architect detailed it, then plans and detailed drawings shall be prepared by the Contractor to clearly indicate the changes required. Changes are subject to the Architect's approval and are not chargeable as cost additions to the Contract Documents. Submit minimum four (4) copies of plans and details along with a written request for and description of the changes. Review stamps placed on shop drawings do not constitute or authorize changes to the Contract. Changes can only be made in accordance with Article E-15, Changes In The Work.

Article E-6. Drawings and Specifications at the Site.-

(a) *Documents at 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.

(b) *Record Documents.*-The set of drawings and specifications kept at the job site shall be labeled, "Record Documents" on which all changes to the construction contract documents shall be made with colored pens. Changes to drawings and specifications shall be made concurrently with construction progress. Do not conceal any work until required information is recorded. Drawings shall be legibly marked to record actual construction:

- (1) Depths of various elements of foundations in relation to finish floor elevation.
- (2) Horizontal and vertical locations of underground utilities and appurtenances, referenced to finish floor elevation or permanent surface improvements.
- (3) Location of internal utilities and appurtenances concealed in the construction and referenced to finish floor elevation or other accessible features of the structure.
- (4) Field changes of dimensions and detail.
- (5) Changes made by field order or change order.
- (6) At contract close-out, deliver Record Documents to the Architect indicating:
 - (a) Date
 - (b) Project title and number
 - (c) Signature of Contractor or his authorized representative.

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

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

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

(a) *Payment for.*-Unless otherwise stipulated, the contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation, and other 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 stipulated, all materials shall be new, and both the workmanship and materials shall be of good quality. The Contractor shall, if required furnish satisfactory evidence as to the kind and quality of materials and work. The burden of proof is on the Contractor. [See also Article E-13]

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

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

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

(a) *General.*-The Owner shall furnish all surveys unless otherwise specified. Permits and licenses of a temporary nature necessary for the prosecution of the work shall be obtained and paid for by the Contractor. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be obtained and paid for by the Owner unless otherwise specified. The Contractor 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. Building permits, access permits and all other similar temporary permits required for prosecution of the work shall be obtained and paid for by Contractor. Fees for building plan review, water connections, sewer connections and similar fees shall also be paid by Contractor. [See also Articles E-10 and E-42]

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

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

(d) *Call-Before-You-Dig Law.*-Pursuant to House Bill No. 1651, Contractor shall call the "Utilities Protection Center" at 1-800-282-7411 for assistance in locating gas lines and other underground utilities; and shall comply fully with the requirements of this law.

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

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

(b) *Safety Precautions.*-The Contractor shall comply with the rules and regulations of OSHA for safety and prevention of accidents, and shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work arising out of and in the course of employment on work under the contract. The Contractor alone shall be responsible for the safety, efficiency, and adequacy of his plant, appliance, 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, shall act, at his discretion, to prevent such threatened loss or injury. Any remuneration claimed by the Contractor on account of emergency work shall be determined in accordance with allowances permitted on force account under Case (c) of Article E-15 of the general conditions.

(d) *Blasting.*-In the absence of an express provision in the contract permitting blasting, there shall be no blasting. If blasting is permitted under the contract and under the Law which is applicable to the premises [including but not limited to "Georgia Blasting Standards Act of 1978" as amended], such blasting shall in all events be done in such manner as to prevent all scattering. (See also Article E-27)

(e) *Rain Water, Surface Water, and Back-up.*-The Contractor shall protect all work, including but not limited to excavations and trenches, from 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 Law 1969, Pages 50 and following, and any amendments and regulations pursuant thereto, (Acier – III)

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

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

(h) *Building Construction Safeguards.*-The Contractor acknowledges and agrees that he is the person responsible under the law and that he is the person EMPLOYING or directing others to perform labor within the meaning of 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.

Article E-13. Inspection of Work.-

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

(b) *Notice to Architect from Contractor Prior to Covering Work.*-If the specifications, the Architect's instructions (either in the specifications or issued later in writing), laws, ordinances or any public authority require any work to be specially tested or approved, the Contractor shall give the Architect timely notice in writing of its readiness for inspection, and if the inspection is by (Acier – III)

any authority other than the Architect, of the date fixed for such inspection. [See also Article E-58] Inspections by the Architect shall be made promptly and where practicable at the source of supply. If any work should be covered without approval or consent of the Architect, it must, if required by the Architect, be uncovered for examination at the Contractor's expense. [See also Article E-58]

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

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

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

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

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

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

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

Article E-15. Changes in the Work.-

(a) *Owner's Right to Make Changes.*-The Owner without invalidating the contract may authorize or order extra work or may authorize or order changes by altering, adding to, or deducting from the work, the contract sum being adjusted accordingly. The

Contractor hereby expressly agrees that the Contractor shall have no right to a claim for damages or extended overhead because of changes made by the Owner. Such work is hereinafter designated "change" or "changes". All such changes shall be performed under the conditions of the original contract except that any claim for extension of time caused thereby shall be adjusted at the time of signing of the change order form. [See Article E-1 for definition of the change order form]

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

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

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

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

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

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

(e) *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: The Contractor shall in any event give written notice to the Owner before proceeding to execute any change resulting from subsurface conditions and, PROVIDED 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) other than or in excess of the allowances permitted under Article E-15, and PROVIDED FURTHER: That 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 "allowances 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. Unless otherwise

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provided no removal of rock as defined herein shall be included in the base bid. 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. Rock is defined as follows:

- (1) *Mass rock* is defined as any material which cannot be excavated with a single-tooth hydraulic ripper drawn by a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds (Caterpillar D 8K or equivalent) and occupying an original volume of at least one cubic yard.
- (2) *Rippable rock* is defined as any material which cannot be excavated with a single engine pan (Caterpillar 621 or equivalent) which is pushed by a crawler tractor (Caterpillar D 8K or equivalent) and occupying an original volume of at least one cubic yard.
- (3) *Trench rock* is defined as any material that must be removed from a trench which cannot be excavated with a backhoe having a bucket curling factor rated at not less than 18,300 pounds (Caterpillar Model 215 or equivalent) and occupying an original volume of at least one-half cubic yard.

(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 this work. No consideration will be given any claim based on lack of knowledge of existing conditions except where existing conditions are such as cannot be readily ascertained. Any claims relating to conditions which were not readily ascertainable shall be adjusted as provided in the contract for changes in the work.

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

- (1) For the Contractor an allowance for work which he performs with his own forces, not to exceed 20% of his "net additional allowable expenditures", if any, for changes.
- (2) For a subcontractor an allowance for work which he performs with his own forces, not to exceed 20% of his "net additional allowable expenditures", if any, for changes. A subcontractor shall receive no allowance for overhead and profit on work not performed by his own forces. Under this contract, the forces of a subcontractor of a subcontractor are deemed to be and are the forces of the subcontractor. [See also Articles E-36 and E-37]
- (3) For the Contractor an allowance for work performed by his subcontractor, not to exceed 7½% 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 superintendence of productive labor in execution of changes. All expenditures not included in the term "allowable expenditures" as limited and defined in this article shall be considered as overhead, including, but not limited to, insurance other than that which is mentioned in this article, bond premiums, supervision, travel (meals, transportation, and lodging), superintendence, [except *pro rata* time of foremen as referred to herein], timekeepers, clerks, watchmen, hand tools, small tools, incidental job burdens, engineering, drafting, and office expense. Any other provisions in the contract documents to the contrary notwithstanding, only demonstrable, direct, out-of-pocket expenditures for the changes plus percentages as set forth hereinabove shall be allowable to the Contractor 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 services and materials, the burden of proof being on the Contractor.

(j) *Stipulated Maximum Sum.*-Under Case (b) and Case (c), the Owner shall prescribe the limits of any authorization or order for a change by means of an authorization or order in writing stipulating the maximum sum of money committed toward execution of the said change, and the Contractor shall have no authority to perform any change which will cost the Owner in excess of the stipulated maximum sum. It shall be solely the Contractor's responsibility to apply in writing to the Owner and 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 mutually agreed to under Case (a) or in excess of such amount as shall have been established as the stipulated maximum sum under Case (b) or Case (c). The cost to the Owner for any change in the work, except a change based upon agreed unit prices under Case (b), shall be established in accordance with the schedule of allowances and percentages stipulated under Article E-15(h).

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

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

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

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

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

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) *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 decisions of the Architect shall deprive the Owner or the Contractor of any form of redress which may be available under the laws of the State of Georgia to contracting parties. Any decision of the Architect shall be final and binding on the Contractor in the absence of written notice of protest from the Contractor received by the Owner by registered mail within twelve days of the date of the decision of the Architect. [See also Articles E-3 and E-39]. The Owner shall have twelve days from the date of receipt of a protest within which to investigate and make 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 issues, (3) a citation of the provision or provisions of the contract documents which govern the issue or issues, (4) a summary of the logical principle or principles on which the protest is based, and (5) a summary of the legal grounds for taking exception.

(c) *Shall be Based on the Legal Assertions of the Contractor.*-The Contractor shall assert claims solely on the basis of (a) principles of logic and (b) principles of law to which the Contractor, himself, 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 judgement such views, requests, and legal

propositions as he deems the Contractor is entitled to maintain independently of any right of any subcontractor, materialman, or supplier against the general Contractor. [See also Article E-36]

(d) *Conference with the Owner.*-

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

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

(3) *Basis for and Terms of.*-All conferences between the Owner and the Contractor shall be pursuant to, under the terms of, and in accordance with this article of the general conditions.

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

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

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

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

(d) *No Damages for Delay.*-In the event of any delay, not the fault of the Contractor, the Contractor shall be entitled to an extension of time for completion only, and not shall be entitled to any additional payment on account of such delay. Without limiting the foregoing, except as otherwise specifically provided under Article E-15 or E-22, the Contractor shall not be entitled to payment or compensation of any kind from the Owner for direct, indirect or impact damages, including but not limited to costs of acceleration arising because of hindrance or delay from any cause whatsoever, whether such hindrances or delays be reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable; provided, however, that this provision

shall not preclude recovery by the Contractor of damages for hindrances or delays due solely to fraud or bad faith on the part of the Owner or his agents.

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

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

(b) *Remedy of the Owner for Breach of Order of Condemnation.*-If the Contractor does not make a good 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, perform unexecuted work, replace and re-execute work not done in accordance with the methods and materials designated in the contract documents and deduct the cost thereof from any payment then or thereafter due the contractor, Provided: That the Architect shall approve the amount charged to the Contractor. [See also Article E-21]

The remedies stated in this article are in addition to the remedies otherwise available to the Owner, do not exclude such other remedies, and are without prejudice to any other remedies. Time limits stated in orders of condemnation are of the essence of the contract. Unless otherwise agreed to by the Owner in writing, the making good of condemned work shall physically commence at the site in not more than seven days after receipt of the order of condemnation except that in case of emergency correction shall physically commence at the site at once and except that the Contractor shall in any event physically commence the correction at the site early enough to complete within the space of time allowed in the order of condemnation. The Owner will give prompt consideration to reasonable requests for delay in commencement of making good on 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 to the performance of any unexecuted work condemned by the Architect. [See also Article E-1] In the absence of such notice, it shall be and is presumed under this contract that there has been no correction, supplying remedy, or performance of unexecuted work.

Article E-20. Correction of Work After Final Payment.-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 there from and pay for any damage to other work resulting therefrom. The Owner shall give notice of observed defects or omissions with reasonable promptness. The Contractor shall within the space of time designated in orders of condemnation and without expense to the Owner correct, remedy, replace re-execute, supply omitted work or remove from the premises all work condemned by the Architect. The Contractor shall give prompt notice in writing to the Architect, with copy to the owner, upon completion of the supplying of any omitted work or the correction of any work condemned by the Architect. In the absence of said notice, it shall be and is presumed under this contract that there has been no correction of the condemned work or supplying of omitted work. If the Contractor does not remove, make good the deficiency, correct, or remedy faulty work, or supply any omitted work within the space of time designated in orders of condemnation without expense to the Owner, the Owner, after ten days' notice in writing to the Contractor, may remove the work, correct the work, remedy the work or supply omitted work at the expense of the Contractor. In case of emergency involving health, safety of property. or safety of life the Owner may proceed at once. Correction of defective work executed under the plans and specifications or supplying of omitted work whether or not covered by warranty of a subcontractor or 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 the operation of the statute of limitations. As additional security for the fulfillment of such obligation, but in no way limiting the same, the Contractor warrants and guarantees (1) that all work executed under the plans and specifications shall be free from defects of materials and workmanship

for a period of one year from the date of final certificate of the Architect, and (2) that for not less than one year from the date of the final certificate of the Architect, or for such greater space of time as may have been designated in the specifications, products of manufacturers shall be free from defects of materials 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 principal, ratifies the warranties or guaranties of his aforesaid agents by the filing of the aforesaid instruments with the Owner. The Contractor as principal is liable for the acts or omissions of his agents.

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

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

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

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

Article E-22. Right of the Owner to Terminate Contract.-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 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 therefor. [See Article E-15 for description of "force account"] [See also Article E-26]

Article E-23. Contractor's Right to Stop Work or Terminate Contract.-If the work should be stopped under an order of any court or other 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 days' written notice to the Owner and the Architect, stop work or terminate this contract and recover from the Owner payment for all work executed and any loss sustained upon any plant or material and reasonable profit and damages.

Article E-24. Application for Payments.-

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

(b) *Initial Breakdown and Periodical Payments.*-If payments are made on valuation of work done, such application shall be submitted at least fifteen 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 to 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 (Form 37 as attached to these General Conditions) with a complete breakdown of the contract price so arranged and so itemized as to meet the approval of the Architect and, if requested, supported by such evidence as to its correctness as the Architect may direct. The schedule, designated herein the "initial breakdown" [specimen of which will be supplied to any bidder], when approved by the Architect shall be used as the 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 sales or such other procedure as will establish the Owner's title to such material or otherwise adequately protect the Owner's interest. [See also Articles E-28 and E-32] The Contractor is responsible for the existence, protection, and, if necessary, replacement of materials until execution of the final certificate of the Architect. [See also Articles E-12, E-25 and E-41] The Owner shall not pay for any material stored off site.

Article E-25. Certificates of Payment.-

(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 each 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 of entire use or occupancy of the work by the Owner shall be an acceptance of any work or materials not in accordance with the contract documents. [See also Article E-20]. The making of the final payment shall constitute a waiver of all claims by the Owner other than those arising from unsettled liens, from faulty work appearing after final payment, or from requirements of the specifications or drawings. Acceptance of final payment shall operate as and shall be a release to the Owner from all claims of any kind or character under the contract except for such specific amount or amounts as may have been withheld to cover the fair value of any incomplete work which has been certified by the Architect under the provision of paragraph (d) of Article 5 of the form of agreement as incomplete through no fault on the part of the Contractor.

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

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

Article E-26. Payments Withheld.-The Architect may withhold or, on account of subsequently discovered evidence, nullify the whole or 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 of for materials or labor. [See also articles E-9 and E-37]
- (d) A reasonable doubt that the contract can be completed for the balance then unpaid.
- (e) Damage to another Contractor or to some third party. [See also Article E-12]

- (f) Failure to maintain a rate of progress in accordance with the construction progress schedule. [See also Articles E-1(i), E-25(c), and E-46]
- (g) Failure to supply enough skilled workmen or proper materials. [See also Articles E-1 and E-19]

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

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 save the Owner and the Architect harmless and to indemnify and defend same from every claim arising out of or through injury (including death) to any person or persons or damage to property (regardless of who may be the Owner of the property) arising out of or suffered through any act of omission of the Contractor or any subcontractor, or anyone either

- 1. directly or indirectly employed by or
- 2. under the supervision of any of them in the prosecution of the work included in this contract.

(b) *Insurance.*-Insurance shall be written on a per occurrence basis as opposed to a claim made basis. Proof of insurance coverage and furnishing of insurance policies shall be as shown hereinbelow.

(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 beginning any work by the Contractor the Contractor will furnish the following to the Owner: Certificate from the 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 provisions respecting workmen's compensation is also applicable to subcontractors, except that subcontractors shall not be required to submit a certificate of insurance to the Owner. The general Contractor shall submit a certificate on the letterhead of the Contractor to the Owner in the following language:

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

(2) *Indorsement on Builder's Risk Policy.*—There shall be attached to and made a part of the insurance policy for BUILDER'S RISK an indorsement of the insurance company in accordance with the specimen set forth in Exhibit A.

(3) *Indorsement of Casualty Policies.*—There shall be attached to and made a part of every CASUALTY INSURANCE POLICY an indorsement of the insurance company in accordance with the specimen set forth in Exhibit B.

(4) *Ratification of Agent's Indorsement.*—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 indorsement 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 the name of the Owner as insured. [See Invitation to Bid for exact legal name of Owner.]

Bodily injury, including death and property damage as combined single limits in the amount of \$1,000,000.00.

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 and property damage written as combined single limit in the amount of \$1,000,000.00.

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 and property damage written as combined single limits in the amount of \$1,000,000.00.

DISPOSITION: Certificate of insurance must be sent to Owner prior to commencement of work.

- [4] CONTRACTOR'S AUTOMOBILE LIABILITY INSURANCE- Taken out in the name of the Contractor.

Bodily injury, including death and property damage written as a combined single limit in the amount of \$1,000,000.00 for any auto, either owned or non-owned.

DISPOSITION: Certificate of insurance must be sent to Owner prior to commencement of work.

- [5] BUILDER'S RISK INSURANCE- payable to the Contractor and Owner, as their interests may appear, for the amount of the contract including all materials in or adjacent to the building which are to be made a part of building 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 company or 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.

(e) *Blasting.*-If the specifications expressly permit blasting, the Contractor's protective liability insurance, Contractor's public liability insurance and Owner's protective liability policy shall have an endorsement ("X" coverage) which specifically provides coverage for blasting.

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

Article E-29. Bonds on Roofs and Walls.-

(a) *Five-Year Bond.*--Prior to demand for payment of retainage, the Contractor shall furnish to the Owner a five-year bond written by a surety authorized to do business in the State of Georgia in accordance with Form No. 299 set forth in Exhibit E and in the penal sum of not less than the amount shown as the cost of the roof and roof deck in the approved initial breakdown.

(b) *Manufacturer's Roofing Bond or Manufacturer's Full Service Guarantee.*--In addition to the five-year bond, the Contractor shall furnish to the Owner a manufacturer's roofing bond or manufacturer's full service guarantee covering materials and workmanship in the form and style of the roofing manufacturer whose materials were used, the period covered by the bond or guarantee and the terms of which are detailed in the specifications section under which the roofing system or systems is specified.

Article E-30. Performance Bond and Payment Bond.--The Contractor shall furnish both a performance bond and a payment bond (Form 160) as set forth Exhibit f and Exhibit G. 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]

Article E-31. Omitted.

Article E-32. Liens.--Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the Owner a complete release of all liens or claims arising out of this contract, or receipts in full in place thereof and, if required in either case, an affidavit that so far as he has knowledge or information the releases and receipts include all labor and materials for which a lien or claim could be filed; but the Contractor may, if any subcontractor or claimant refuses to furnish a release or receipt in full, furnish a bond satisfactory to the Owner to indemnify the Owner against any lien or claim. If any lien or claim remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such lien or claim, including all costs and a reasonable attorney's fee. [See also articles E-24, E-25, and E-28]

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

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

Article E-35. Separate Contracts.-

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

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

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

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

(a) *Submission of list.*--As soon as possible after notice of award of the contract and in any event not later than three days prior to the time fixed in the contract for delivery of the executed form of agreement to the Owner, the Contractor shall submit in

writing to the Architect a list of the names of subcontractors the Contractor will employ on the work. The list of subcontractors is not submitted for approval but is for the purpose of establishing...

- (1) What trades and portions of the work are to be performed under subcontract, and
- (2) The names of the parties selected by the Contractor to perform work by subcontract, the aforesaid selection being a matter lying solely within the discretion of the Contractor.

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

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

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

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

(f) *No Contract Between Owner and any Subcontractor, Materialman, Supplier or Employee.*-Nothing contained in the contract documents shall create any contractual relation between the Owner and any subcontractor or between the Owner and any materialman, supplier or employee of the Contractor or his subcontractors. [See also Articles E-2, E-37, E-45 and E-60]

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

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

THE SUBCONTRACTOR AGREES

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

- (2) To submit to the Contractor applications for payment in such reasonable time as to enable the Contractor to apply for payment under Article E-24 of the general conditions.
- (3) To make all claims for extras, for extensions of time [See Articles E-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

- (1) To be bound to the subcontractor by all the obligations that the Owner assumes to the Contractor under the contract documents.
- (2) To pay the subcontractor upon the payment of certificates issued under the schedule of values described in Article E-24 of the general conditions the amount allowed to the Contractor on account of the subcontractor's work to the extent of the subcontractor's interest therein; provided, however, that retainage shall be paid to the subcontractor as provided in the statutory affidavit specified under Article E-28.
- (3) To pay the subcontractor upon the payment of certificates issued otherwise than as in Subparagraph E-37(a)(5) above in such manner that at all times the subcontractor's total payments should be as large in proportion to the value of the work done by the subcontractor as the total amount certified to the Contractor is to the value of the work done by the subcontractor.
- (4) To pay the subcontractor to such extent as may be provided by the contract documents or the subcontract, if either of these provides for earlier or larger payments than the above.
- (5) To pay the subcontractor on demand for his work or materials as far as executed and fixed in place, less the retained percentage, at the time the certificate should issue, even though the Architect fails to issue it for any cause not the fault of the subcontractor.
- (6) To pay the subcontractor a just share of any fire insurance money received by the Contractor.
- (7) To make no demand for liquidated damages or penalty for delay in any sum in excess of such amount as may be specifically named in the subcontract.
- (8) That no claim for services rendered or materials furnished by the Contractor to the subcontractor shall be valid unless written notice thereof is given by the Contractor to the subcontractor during the first ten days of the calendar month following that in which the claim originated.
- (9) To give the subcontractor an opportunity to be present and to submit evidence in any dispute involving rights of the subcontractor. [See also Article E-36(e)]

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

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

Article E-38. Architect.-

(a) *Supervision.*-The Architect shall have general supervision and direction of the work except in respect to safety as stated under Article E-12 and except as qualified by Articles E-13 and E-60 of the general conditions. He is the agent of the Owner only when in special instances he is authorized in writing by the Owner so to act, and in such instances he shall, upon request, show the

Contractor written authority. He has authority to stop the work whenever such stoppage may be necessary to 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 shall be that of the former Architect.

Article E-39. Architect's Decisions.-

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

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

(c) *Claims for alleged procrastination.*-No claim for delay to the Contractor or for additional expense to the Contractor shall be allowed on account of failure of the Architect to render decisions, make interpretations, or furnish additional instructions 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]

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]

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 intransferable contractual obligation to the Owner to make his own inspections of his own work at all stages of construction; and he shall supervise and superintend performance of the contract in such manner as to enable him to confirm and corroborate at all times that all work has been executed strictly, literally, rigidly, and inflexibly in accordance with the methods and materials designated in the contract documents so that (a) his certifications on periodical estimates shall be true and correct and (b) his notice of readiness for final inspection shall be true and correct. [See also Articles E-13, E-14, E-24, E-26 and E-46] Accordingly, the Contractor agrees that he may not defend or excuse any deviation from the contract documents on the ground (a) that the deviation was not brought to his attention by another person or party or other persons or parties or (b) that a subcontractor is or subcontractors are at fault.

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

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

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

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

Article E-45. Specification Arrangement.-The specifications are separated into numbered and titled divisions for convenience of reference. Neither the Owner nor the Architect assumes any responsibility for defining the limits of any subcontractors 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 C-03, E-2, E-36 and E-37]

Article E-46. Commencement, Prosecution and Completion.-The Contractor will be required (a) to commence work under this contract within ten days after date of written notice from the Owner to proceed [See Article E-1(j)], (b) to prosecute the work with faithfulness and energy (c) to install the various parts of the work with equal steps shown on the construction progress schedule and at the same rate shown on the construction progress schedule to be furnished pursuant to Article E-50, and (d) to complete the work within the time stipulated in the 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 [Article E-1(f) of general conditions.] For account of recovery of lost time required of the Contractor for his 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]

Article E-47. Alternates.-Unless otherwise stipulated all alternate bids are deductive. No alternate bids will be taken unless the base bid exceeds the amount of money budgeted for the project prior to the opening of bids, and any alternate, or alternates, if taken, will be in numerical sequence to the extent necessary to reduce the cost to a sum which is not in excess of the amount budgeted if possible. [See also Article C-04(d)]

Article E-48. Public Employees Hazardous Chemical Protection and Right to Know Act of 1988.-The Contractor acknowledges that he is fully aware of the contents and requirements of Chapter 22 of Title 45 of the Official Code of Georgia. The Contractor upon submission of a proposal in connection with this chapter does hereby certify that it and its subcontractors are in compliance with the aforesaid code section.

Article E-49. Conflicts.-The following principles shall govern the settlement of disputes which may arise over conflicts in the contract documents: (a) as between figures given on drawings and the scaled measurements, the figures shall govern; (b) as between large-scale drawings and small-scale drawings, the larger scale shall govern; (c) as between drawings and specifications, the requirements of the specifications shall govern; and (d) as between the form of agreement and the specifications, the requirements of the form of agreement shall govern. Conflicts noted shall be reported to the Architect. The principles set forth herein shall not alter provisions of Article E-2 of the general conditions. Schedules, lists, indexes, tables, inventories, written

instructions, written descriptions, summaries, statements, classifications, specifications, written selections, or written designations although appearing on the drawings are deemed to be and are "specifications" within the meaning of Article E-49.

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

Article E-51. Office for Resident Engineer Inspector.-The Contractor shall provide as his expense a temporary office at the site of the work for the use of the resident engineer inspector. The office shall be water-tight and shall be provided with heat, electric lights, telephone extension, and adequate windows. The Contractor shall also provide plan table and rack, chair, legal-size fiber transfer file with fifty (50) manila folders for the permanent records, and use of such business machines as may be necessary for the resident engineer inspector duties.

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.

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 to the Architect. The plans and specifications shall be adhered to in all cases where they call for quality of materials, quality of workmanship, or quality of construction which is equal to or in excess of the quality called for in the manufacturer's recommendations or requirements. There may be no deviations from the plans and specifications except to the extent that the said deviations shall be necessary in order to comply with the manufacturer's express recommendations or express requirements. Any changes necessary to comply with the manufacturer's express recommendations or express requirements shall be made at no additional expense to the Owner. [See also Articles E-5, E-43, E-55 and E-67]

Article E-54. 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 shall prepare and furnish with the keys an itemized key schedule in quintuplicate listing the door or room number and/or description, serial number of key, and number of keys being delivered for each door or lock.

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 in operation and shall make all tests and adjustments. The Contractor shall furnish proper instructions to the lessee of the Owner in the presence of the Architect concerning operation and maintenance of all mechanical and electrical equipment. The Contractor shall give notice in writing to the Architect with copy to the Owner at least fifteen days prior to the date on which it is proposed to give instructions to the lessee. The aforesaid notice shall state the date and hour the giving of instructions will commence. The aforesaid notice shall not (repeat NOT) be given to the using agency. For all items of mechanical and electrical equipment or apparatus installed which require operation or maintenance after occupancy, the Contractor shall furnish and deliver to the Owner [not (repeat NOT) to the lessee] complete brochures and data as

prepared and published by the manufacturers covering details of operation and maintenance. [See also Articles E-53, E-62 and E-67]

Article E-56. Space Conditions.-All pipes passing through floors, walls and ceiling 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 space, dimensions or other design conditions do not permit compliance with the present article, the Contractor shall file a demand in writing with the Architect for additional instructions pursuant to Article E-3, furnishing a copy of the aforesaid demand to the Owner. [See also Articles E-3 and E-40]

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

Article E-58. Testing Services.-Laboratories for testing services shall be selected by, engaged by, and responsible to the Architect, Provided: That, in the case of test (a) prescribed in the Contract Documents or any part thereof, including Article E-13 of the general conditions or (b) requested by the Architect the Contractor shall give notice to the Architect in writing stating the date and the hour when he will be ready for the test to be made and in the event the test fails or the Contractor is not ready for the test, the expense of the service 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 for 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 "Georgia Geological Survey, Room 400, 19 Martin Luther King Jr., Drive, S. W. Atlanta, Georgia 30334". 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 of material drilled through shall be taken at every ten feet of additional depth and at every change of formation. Samples shall be placed in glass jars of one pint size. The jars 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 progress of the work shall be accurately recorded in the log book. The log book shall be delivered to the Owner at 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 or any part of it be set up as a defense by the Contractor against a claim for failure on his part to install the work in accordance with the contract documents or for any neglect to fulfill requirements of the contract; nor shall the presence of any one, or all, or any of the foregoing at the site or the fact that any one, or all or any of the foregoing may have examined the work or any part of it be set up as a defense by the Contractor against a claim for failure on his part to install the work in accordance with the Contract Documents or for any neglect to fulfill requirements of the contract. No requirement of this contract may be altered or waived except in pursuance of a written order of the Owner and in strict accordance with the provisions in the contract for changes in the work. [See also Articles E-9, E-13, E-14, E-15, E-20, E-36, E-37, E-38 and E-39]

Article E-61. Omitted.

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 percent 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 reasonable 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. PROVIDED FURTHER, However, That prior to asking for a final inspection the initial test and balance reports shall have been submitted to the Architect for review. [See also Article E-55] [See also Article E-71 for specimen of form of agreement]

Article E-63. 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 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.

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 would have had if the provision thus created had read originally as it reads subsequently to the (1) addendum, (2) amendment, (3) bulletin, (4) notice of detention, (5) notice of omission, or (6) change order by which it was created.

Article E-65. Concrete Specifications.-"Standard Minimum Concrete Specifications", October 1963, revised May 1976, revisions approved jointly by Georgia Branch, The Associated General Contractors of America, and Georgia Concrete and Products Association, Inc., successors to Georgia Ready-Mix Concrete Association are adopted as a minimum requirement, but in the event any other provision of the contract documents provides for materials, conditions, or services which exceed in quality the materials, conditions, or services required under the aforesaid "Standard Minimum Concrete Specifications", October 1963, revised May 1976, the higher quality of materials, conditions, or services shall govern. Copies of the above-mentioned "Standard Minimum Concrete Specifications" may be obtained from Georgia Branch, Associated General Contractors of America; 163 Harris Street, N.W.; Atlanta, Georgia, without cost. Paragraph 3.3(d) of the aforesaid revised "Standard Minimum Concrete Specifications" is hereby amended by deleting the eighth line in its entirety and substituting in place thereof the following:

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

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

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

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

Article E-66. 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 or 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.

Article E-67. Certificates of Manufacturers for Major Components.-For elevators, moving walks, dumbwaiters, 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), and certificate(s) of the manufacturer(s) shall be filed with the Owner on the letterhead(s) of the manufacturer(s) in which the manufacturer(s) certifies or certify that "the equipment has been installed in strict compliance with the recommendations of the manufacturer(s) and is operating properly". [See specimen of certificate, Form No. 290 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 service and shall, in all cases where the equipment of two or more manufacturers ties in and functions together, require the field representatives to perform simultaneously the initial start-up, the testing, and the placing of their equipment into operation. "Start-up" is defined as putting the equipment into action. "Testing" is defined as performing such testing as is stipulated in the contract documents to be performed. "Placing into operation" is defined as operating the equipment for a sufficient period of time for the determination to be made that it is performing properly. [See also Articles E-53 and E-55] See Exhibit H, Form No. 290 (less enclosure thereto)—Specimen Certificate of Manufacturer.

Article E-68. Valuable Material, Geological Specimens.-If during the execution of the work, the Contractor, any subcontractor, or any servant, employee, or agent of either should uncover any valuable material or materials such as, but not limited to, treasure, geological specimens, archival material or materials, or ore, the Contractor acknowledges that title to the foregoing is vested in the Owner. The Contractor shall notify the Owner upon discovery of any of the foregoing, shall guard it, and shall deliver it promptly to the Owner. The Contractor agrees that the Geologic and Water Resources Division of the Georgia Department of Natural Resources may inspect the work at reasonable times consistent with the convenience of the Contractor.

Article E-69. Copies of Notices to Owner.-Wherever the general conditions provide that a copy of any notice, request, or demand filed with the Architect by the Contractor shall be furnished to the Owner, such notice, request or demand shall not become effective until the Owner's copy shall have been received by the Owner. No notice in writing or orally to the Architect or to the resident engineer inspector is notice to the Owner unless copy of the aforesaid notice in writing shall have been properly served upon the Owner at the address shown in the Invitation to Bid.

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

Article E-70. Utilities.-Pending the extension and connection of permanent water, permanent gas, permanent sewer taps, and permanent electric power, the Contractor shall obtain temporary water, temporary gas, temporary electric power, and provide sewage disposal at his own expense. In the absence of provisions to the contrary, the Contractor shall pay for all utilities services until the final certificate has been executed or until the work is occupied, whichever is the earlier. [See also Article E-9]

(a) *Toilets.*-Contractor shall also provide his own temporary, portable type toilet facilities. These facilities shall be maintained and serviced in a sanitary condition during the course of the work in accordance with local health codes/ordinance. Location of toilet facilities shall be coordinated with Owner and Architect.

(b) *Telephone.*-Contractor shall provide his on the job telephone.

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]

See Exhibit I: Form No. 418, "FORM OF AGREEMENT BETWEEN CONTRACTOR AND OWNER"

EXHIBITS FOLLOW

EXHIBIT A

INDORSEMENT—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 Indorsement _____
 _____ (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)* Furniture and equipment may be delivered to the insured premises and installed in place 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 cancelled, changed, allowed to lapse or allowed to expire until thirty (30) days after the Owner and Architect have received written notice thereof as evidenced by return receipt of registered letter. 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 such 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)* In the event the notice referred to hereinabove in Item No. (4) is never issued 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)

EXHIBIT B

INDORSEMENT—CASUALTY

Attached to and forming part of Policy No. _____ of the
(Number of Policy)

_____ Insurance Company, issued at

Its _____, _____ Agency.
(City) (State)

Date of Indorsement _____

Project No. _____

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 cancelled, allowed to lapse or allowed to expire until thirty (30) days after the Owner and Architect have 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) If the notice referred to above in Item No. (1) is never issued, 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)

EXHIBIT C

NON-INFLUENCE AFFIDAVIT

COUNTY OF _____

STATE OF _____

I do solemnly swear on my oath that as to the contract dated _____, 19____,
between _____ and the _____
Name of Contractor 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 _____ or any person connected with the State
Name of Owner
Government of Georgia in any way whatsoever.

This _____ day of _____, 19_____.

Signature (L.S.)

Title

Firm

COUNTY OF _____

STATE OF _____

Personally before me, the undersigned authority, appeared _____,
Name of Person Signing Affidavit

who is known to me to be an official of the firm of _____, who, after being duly
General Contractor
sworn, stated on his oath that he has read the above statement and that the same is true and correct.

Notary Public

My commission expires _____

This _____ day of _____, 19_____.

EXHIBIT D

STATUTORY AFFIDAVIT

COUNTY OF _____

STATE OF _____

FROM: _____
(Contractor)

TO: _____, Owner

RE: Contract entered into the _____ day of _____, 19_____, between
the above-mentioned parties for the construction of Project No. _____
located at _____.

KNOW ALL MEN BY THESE PRESENTS:

1. The undersigned hereby certifies that all work required under the above contract has been performed in accordance with the terms thereof, that all materialmen, subcontractors, mechanics, and laborers have been paid and satisfied in full, and that there are no outstanding claims of any character [included 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 below:.....

[Instructions-ENTER THE WORD "NONE" OR LIST THE NAMES OF THE 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 in injury or death to any employees, subcontractors, or the public at large arising out of the performance of the contract, or any suits or claims for any other damage of any kind, nature, or description which might constitute a lien upon the property of the Owner.

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

This _____ day of _____, 19_____.

_____(L.S.)
Signature

Title

Firm

COUNTY OF _____

STATE OF _____

Personally before me, the undersigned authority, appeared _____,
Name of Person Signing Affidavit

who is known to me to be an official of the firm of _____, who, after being
Name of General Contractor

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 _____, 19_____

EXHIBIT E

FIVE-YEAR BOND ON ROOFS AND WALLS

STATE OF GEORGIA

COUNTY OF _____

1. Know all men by these presents, that we _____ as Principal, and
General Contractor

_____, as Surety are held and firmly bound unto _____
Name of Surety Name of Owner

in the sum of _____ Dollars (\$ _____)
for the payment of which well and truly to be made and done, we bind ourselves, our executors and administrators, our successors
and assigns, jointly and severally, by these presents.

2. The condition of the above obligation is such that WHEREAS _____
General Contractor

has entered into a contract with _____ dated _____
Name of Owner Date of Contract

for construction of Project No. _____

3. WHEREAS, the said _____ warrants with respect to the said work that
General Contractor

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

- (a) Defects or failures resulting from abuse by the Owner.
- (b) Defects in the design which the said _____, shall have brought to the attention
General Contractor

of the _____ in writing prior to installation of the work except, however, that the
Name of Owner

_____ shall not be responsible, insofar as liability under this bond is concerned,
General Contractor

for bringing to the attention of the _____ defects in design involving failure of:
Name of Owner

- (1) Structural frame
- (2) Load bearing walls
- (3) Foundations

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

- (c) Damage caused by fire, tornado, hail, hurricane, acts of God, wars, riots, or civil commotion.

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

4. WHEREAS the said _____ agrees that should any leaks occur in the roofs or
General Contractor

walls of said _____ the said
Name and Number of Project

_____ will promptly remedy the said leaks or defects and pay for any
General Contractor
damage to other work of said improvement or project resulting therefrom, except, however, that when this instrument is executed by a subcontractor this agreement shall, insofar as the subcontractor is concerned, extend only to the work executed by said subcontractor.

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

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be duly executed this
_____ day of _____, 19____.

Principal

WITNESS

By _____

TITLE _____

Surety

WITNESS

By _____

TITLE _____

(*) Attach Power of Attorney

Instructions for execution by General Contractor

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

EXHIBIT F

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That _____ as Principal (hereinafter referred
Legal Title and Address of Contractor
to as "Contractor"), and _____ as Surety (hereinafter
Legal Title and Address of Surety
referred to as "Surety"), are held and firmly bound unto _____
Legal Title and Address of Owner
as Obligee (hereinafter referred to as "Owner"), in amount of _____
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 bounden Principal has entered into a contract with Owner bearing date of _____
_____ for Project No. _____
Date of Project Number and Name of Project

in accordance with drawings and specifications prepared by _____
Full Name and Title of Architect
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, addition or additions to the terms of the contract or 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 or drawings.

2. If pursuant to the contract documents the Contractor shall be declared in default by the Owner under the aforesaid Contract, the Surety shall promptly remedy the default or defaults or shall promptly perform the Contract in accordance with its terms and conditions. It shall be the duty of the Surety to give an unequivocal notice in writing to the Owner within twenty-five (25) days after receipt of a declaration of default of the Surety's election either to remedy the default or defaults promptly or to perform the contract promptly, time being of the essence. In said notice of election, the Surety shall indicate the date on which the remedy or performance will commence, and it shall then be the duty of the Surety to give prompt notice in writing to the Owner immediately upon completion of (a) the remedy and/or correction of each default, (b) the remedy and/or correction 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, materialmen, 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 and materials.

4. It is expressly agreed by the Principal and the Surety that the Owner, if he desires to do so, is at liberty to make inquiries at any time of 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 is provided in this bond it may not demand of the Owner that the Owner shall (a) perform any thing of act, (b) give any notice, (c) furnish any clerical assistance, (d) render any service, (e) furnish any papers or documents, or (f) take any other action of any nature or description which is not required of the Owner to be done under the contract documents.

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

Signed and sealed this _____ day of _____ A.D. 19 _____

IN THE PRESENCE OF:

Principal

Title

Surety

Title

(SEAL)

EXHIBIT G

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 _____ as Principal (hereinafter referred
Legal Title and Address of Contractor
to as "Contractor"), and _____ as Surety (hereinafter
Legal Title and Address of Surety
referred to as "Surety"), are held and firmly bound unto _____
Legal Title and Address of Owner
as Obligee (hereinafter referred to as "Owner"), in amount of _____
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 bounden Principal has entered into a contract with Owner bearing dated _____
_____ for Project No. _____
Date of Project Number and Name of Project

in accordance with drawings and specifications prepared by _____
Full Name and Title of Architect
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 Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and materials supplied in the prosecution of the work provided for in said contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. The said Surety to this bond, for value received, hereby stipulates and agrees that no change or changes, extension of time or extensions of time, alteration or alterations, addition or additions to the terms of the contract or 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 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 claims 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 judgement 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 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; provided 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 place he maintains an office or conducts his business, or his residence, in any post office or branch post office or any letter box under the control of the Post Office Department or, notice may be served in any manner in which the sheriffs of Georgia are authorized by law to serve summons or process. Every suit instituted under this section shall be brought in the name of the claimant without 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 therefor who submits an affidavit that he has supplied labor or materials for such work and payment therefor has not been made, or that he is being sued on any such bond, a copy of such bond and the contract for which it was given, certified by the official who has custody of said bond; 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 13-10-1 *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. 19_____

IN THE PRESENCE OF:

Principal

Title

Surety

Title

(SEAL)

EXHIBIT H

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 Owner 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 installed in strict compliance with the recommendations of the manufacturer, a letter from the manufacturer should be forwarded to the Contractor [with copies to the Architect and the Owner] setting forth a list of the deviations from the recommendations of the manufacturer and stating what remains to be done in order to bring the work into strict compliance with the recommendations of the manufacturer. [See "Definitions" set forth on the last page of this specimen.] Prior to calling upon the representative of the manufacturer for performance of the services necessary to enable him to execute a certificate in accordance with this specimen, it is the obligation of the Contractor to have installed the work in strict compliance with the recommendations of the manufacturer. [See Article E-53 of the General Conditions], and it is likewise the obligation of the Contractor to have put the equipment in good operating condition in absolute and final readiness for the "start-up", "testing", and "placing into operation" as defined hereinbelow by the representative of the manufacturer.]

Name of Owner _____ Date: _____
Address _____
City _____ State _____ Zip _____

Re: Certificate of _____ that equipment or
Legal Name of Manufacturer
components furnished by it has [or have, as the case may be] been installed in strict compliance with its
recommendations and is [or are, as the case may be] operating properly at Project No. _____
Number and Name of Project _____

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 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____.

By _____
Legal Name of Manufacturer
Authorized Representative

(*) The date must be shown

(Form No. 290)
(9-3-69)
[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

EXHIBIT I

FORM OF AGREEMENT BETWEEN CONTRACTOR AND OWNER

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

_____ hereinafter called the Contractor, and _____

_____ hereinafter called the Owner,

WITNESSETH, That the Contractor and the Owner for the consideration hereinafter named agree as follows:

1. **SCOPE OF THE WORK**--The Contractor shall furnish all of the materials and perform all of work shown on the drawings or described in the specifications entitled _____ prepared by James W. Buckley & Associates, Inc. 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 within ten (10) days of Notice to Proceed and shall be completed no later than _____.

3. **THE CONTRACT SUM**--The Owner shall pay the Contractor for the performance of the contract, subject to additions and deductions provided therein, in current funds as follows:

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

- (a) On or ahead of the construction progress schedule; and
- (b) There are no breaches of orders of condemnation; and
- (c) There is no delinquency in the filing of the final breakdown and accounting, together with vouchers, on force account work as referred to in Subparagraphs (k) and (n) of Article E-15 of the general conditions, if the Contractor requests and the Architect approves, the sum being withheld as retainage will be converted to a lump sum and held by the Owner until final completion. 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 in Subparagraphs (k) and (n) of Article E-15 of the general conditions.

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

- (a) Recovers all lost time and puts the work back on schedule; and
- (b) Remedies all breaches of orders of 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 percent retainage on all subsequent periodical estimates. At the discretion of the Owner, the retainage of each subcontractor may be released separately as he completes his work. An application for release of a subcontractor's retainage shall bear the original certificate 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 should 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 right of the Owner under the contract documents.

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

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

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

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

6. THE CONTRACT DOCUMENTS--The general conditions of the contract, the specifications, the drawings, the signed 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 the premium thereon. The performance bond shall guarantee the full performance of the contract.

8. Indemnity by the Contractor: The Contractor agrees to indemnify and hold harmless the Owner and the Architect from any liabilities, damages and costs (including reasonable attorney's fees) to the extent caused by the negligent acts, errors or omissions of the Contractor, its subcontractors, or anyone for whom Contractor is legally responsible.

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

OWNER

CONTRACTOR

BY: Superintendent

BY: Contractor

Secretary

Seal if a Corporation

Georgia Department of Education
Facilities Services Unit

Certificate of the Contractor or His Duly Authorized Representative

Reimbursement Request Number _____ Project Number(s) _____
Project Name _____

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 Number _____ are correct and that all work has been performed and materials supplied in full accordance with the terms and conditions of the contract documents between the _____ (Owner) and _____ (Contractor); dated: _____ and all authorized changes thereto; and that the following is a true and correct statement of the contract account up to and including the last day of the period covered by this estimate and that no part of the "amount due this estimate" has been received.

1. Original Contract Sum	\$0.00
2. Net change by Change Orders	\$0.00
3. Contract Sum to Date(1 + 2).....	\$0.00
a. Total amount earned for work in place (original contract).....	\$0.00
b. Total amount earned for work in place (change orders).....	\$0.00
c. Value of materials stored at site	\$0.00
d. Total amount earned (a plus b plus c).....	\$0.00
e. Amount retained (10%).....	\$0.00
f. Total earned less retained percentage (d minus e)	\$0.00
g. Total previously approved	\$0.00
h. Total due this request for contractor (f minus g).....	\$0.00
i. Amount due this request for architect	\$0.00
j. Total amount requested (h plus i).....	\$0.00

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/Construction Mgr. _____ Date _____

By _____ (Signature) Title _____

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 this account and the amount due him is correct and just and that all work and materials in this Reimbursement Request have been performed in full accordance with the terms and conditions of the contract documents and authorized changes thereto.

Name _____ (Signature) Architect. Date _____

EXHIBIT M

SCHEDULE OF VALUES

APPLICATION NUMBER:

PROJECT NAME:

CAPITAL OUTLAY PROJECT NUMBER(s):

A	B	C	D	E	F	G		H	I
			WORK COMPLETED						
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	FROM PREVIOUS APPLICATION (D+E)	THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G/C)	BALANCE TO FINISH (C-G)	RETAINAGE (IF VARIABLE RATE)
						\$0.00	#DIV/0!	\$0.00	\$0.00
	TOTAL	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	#DIV/0!	\$0.00	#DIV/0!

EXHIBIT N

DETAILED BREAKDOWN SUMMARY

Sheet 1 of 8 Sheets

NAME OF IMPROVEMENT _____

NO. OF IMPROVEMENT _____ CONTRACT PRICE _____

SCHOOL SYSTEM _____ LOCATION _____

CONTRACTOR'S NAME AND ADDRESS _____

Spec. Div. No. (1)	Description Of Division (2)	No. & Kind Of Units (3)	Labor Costs (\$) (4)	Material Costs (\$) (5)	Other Costs (\$) (6)	Total Costs (\$) (7)
1	General Requirements		126,455	3,100	211,030	340,585
2	Sitework		184,319	90,176	21,625	296,120
3	Concrete		218,900	242,106	0	461,006
4	Masonry		877,741	592,149	1,300	1,471,190
5	Metals		134,262	489,573	6,700	630,535
6	Wood & Plastics		49,446	81,619	0	131,065
7	Thermal & Moisture Protection		145,868	233,507	0	379,075
8	Door & Windows		84,384	169,191	0	253,575
9	Finishes		294,447	502,728	5,440	802,615
10	Specialties		13,705	91,130	0	104,835
11	Equipment		400	12,915	0	13,315
12	Furnishings		0	0	0	0
13	Special Const.		44,979	213,041	0	258,020
14	Conveying Systems		0	0	0	0
15	Mechanical		0	0	1,859,075	1,859,075
16	Electrical		0	0	1,013,145	1,013,145
	TOTALS		\$2,174,906	\$2,721,235	\$3,118,315	\$8,014,456

Submitted By: _____

Approved By: _____

Contractor _____

Architect _____

Date _____

Date _____

(INSTRUCTIONS: The sums shown on the breakdown on the)
 (General Contractor for "Plumbing", "Heating", "Electrical,)
 ("Airconditioning", etc., must agree in amount with the)
 ("Total Contract Price" shown on breakdown for these trades.)

SUPPLEMENTAL DETAILED BREAKDOWN

Sheet 2 of 8 Sheets

NAME OF IMPROVEMENT _____

NO. OF IMPROVEMENT _____ CONTRACT PRICE _____

SCHOOL SYSTEM _____ LOCATION _____

CONTRACTOR'S NAME AND ADDRESS _____

Spec. Div. No. (1)	Description Of Division (2)	Number & Kind Of Units (3)	Labor Costs Dollars (4)	Material Costs Dollars (5)	Other Costs Dollars (6)	Total Costs Dollars (7)
1	General Requirements					
	a. Insurance & Bonds	LS			118,485	118,485
	b. Permits	LS			6,470	6,470
	c. Mobilization	1 Mo.	10,030	3,100	7,000	20,130
	d. Testing/Eng.	4 Mo.			17,920	17,920
	e. Supervision	65 Wk.	74,230			74,230
	f. Temp. Utilities	15 Mo.			30,285	30,285
	g. Field Office	15 Mo.			30,870	30,870
	h. Security	15 Mo.	6,285			6,285
	i. Clean-Up	15 Mo.	35,910			35,910
2	Sitework:					
	a. Site Utilities:					
	Water	3280 LF	14,432	19,358		33,790
	Sanitary	1790 LF	31,859	20,871		52,730
	Road Crossing	1 EA	9,240			9,240
	Storm	5280 LF	61,565	39,755		101,320
	b. Fnd. Excavation	3100 LF	19,220		12,240	31,460
	c. Canopy Walkway	4120 LF	4,223	5,562		9,785
	d. Fine Grade	148,000 SF	29,600		6,385	35,985
	e. Termite Treatment	148,000 SF	5,180	1,230		6,410
	f. Temp. Grassing	4 Acres	9,000	3,400	3,000	15,400
3	Concrete:					
	a. Bldg. Foundation	1035 CY	50,625	36,225		86,850
	b. Slab-on-grade	148,000 SF	111,000	82,285		193,285
	c. Trench Drains	7 EA	35,000	32,116		67,116
	d. Equipment Pads	1825 SF	5,475	1,835		7,310
	e. Elevated Slabs	16,000 SF	16,800	7,215		24,015
	f. Reinf. (Material)	170 T		82,430		82,430
4	Masonry:					
	a. Brick	420 M	184,680	50,400		235,080
	b. 4" CMU	7 M	10,890	4,200		15,090
	c. 6" CMU	58 M	97,620	35,800		133,420
	d. 8" CMU	209 M	369,435	128,535		497,970
	e. 12" CMU	17 M	39,400	10,880		50,280
	f. 8" CMU (Rated)	20 M	44,500	13,000		57,500
	g. 12" CMU (Rated)	7 M	90,840	9,800		100,640
	h. Mortar	14,400 EA		66,130		66,130
	i. Sand	2100 CY		29,570		29,570
TOTALS			\$	\$	\$	\$

Submitted By: _____

Approved By: _____

Contractor _____

Architect _____

SUPPLEMENTAL DETAILED BREAKDOWN

NAME OF IMPROVEMENT _____

NO. OF IMPROVEMENT _____ CONTRACT PRICE _____

SCHOOL SYSTEM _____ LOCATION _____

CONTRACTOR'S NAME AND ADDRESS _____

Spec. Div. No. (1)	Description Of Division (2)	Number & Kind Of Units (3)	Labor Costs Dollars (4)	Material Costs Dollars (5)	Other Costs Dollars (6)	Total Costs Dollars (7)
4	Masonry (Cont.)					
	j. Reinforcing	150,000 LF		23,100		23,100
	k. Ties and Anchors	10,000 EA		13,350		13,350
	l. Cavity Insulation	50,000 SF		26,700		26,700
	m. Dampproofing	50,000 SF	8,000	4,830		12,830
	n. Concrete Fill	1100 CY		124,260		124,260
	o. Flashing	5000 LF		2,970		2,970
	p. Brick Cleaning	63,000 SF	7,762	2,588		10,350
	q. Block Cleaning	329,000 SF	12,675	4,225		16,900
	r. Cast Stone	760 LF	5,946	17,839		23,785
	s. Concrete Columns	14 EA	5,993	23,972	1,300	31,265
5	Metals:					
	a. Structural Steel	319 T	79,603	282,227	3,800	365,630
	b. Joists	175 T	31,753	112,577	2,200	146,530
	c. Metal Deck	1426 SQ	21,668	76,822	700	99,190
	d. Misc. Metal	8 T		15,980		15,980
	e. Floor Sleeves	4 EA	500	595		1,095
	f. Aluminum Reveal	760 LF	738	1,372		2,110
6	Carpentry:					
	a. Rough Carpentry	36,150 LF	17,108	27,912		45,020
	b. Finish Carpentry	4200 LF	6,480	11,520		18,000
	c. Millwork:					
	Base	66 LF	2,377	3,878		6,255
	Wall	37 LF	1,150	1,875		3,025
	Shelving	378 LF	16,673	27,202		43,875
	Stain/Finish	471 LF	5,658	9,232		14,890
7	Moisture Protection:					
	a. Roofing:					
	Insulation	1208 SQ	33,588	62,377		95,965
	Membrane	1208 SQ	67,084	124,586		191,670
	Metal Flashing	4132 LF	8,180	14,335		22,515
	b. Spray Fireprfg.					
	Beams	2417 LF	3,164	1,356		4,520
	Deck	45,848 SF	10,015	4,290		14,305
	Joists	8623 LF	14,851	6,364		21,215
	c. Waterproofing	1180 SF	1,260	540		1,800
	d. Caulk & Sealant	2080 LF	1,280	320		1,600
	e. Ceil. Ins. @ Gym.	12880 SF	6,446	19,339		25,785
TOTALS			\$	\$	\$	\$

Submitted By: _____

Approved By: _____

Contractor _____

Architect _____

SUPPLEMENTAL DETAILED BREAKDOWN

Sheet 4 of 8 Sheets

NAME OF IMPROVEMENT _____

NO. OF IMPROVEMENT _____ CONTRACT PRICE _____

SCHOOL SYSTEM _____ LOCATION _____

CONTRACTOR'S NAME AND ADDRESS _____

Spec. Div. No. (1)	Description Of Division (2)	Number & Kind Of Units (3)	Labor Costs Dollars (4)	Material Costs Dollars (5)	Other Costs Dollars (6)	Total Costs Dollars (7)
8	Doors and Windows:					
	a. Hollow Metal	372 EA	29,760	40,815		70,575
	b. Finish Hardware	630 EA	27,090	65,440		92,530
	c. Wood Doors	258 EA	11,352	25,958		37,310
	d. Roll-Up Doors	7 EA	1,407	7,143		8,550
	e. Windows	58 EA	8,700	11,510		20,210
	f. Alum. Storefront	3 EA	2,439	9,301		11,740
	g. Glass & Glazing	3636 SF	3,636	9,024		12,660
9	Finishes:					
	a. Plaster	398 SY	12,710	11,940		24,650
	b. Drywall	31,500 SF	45,600	106,400		152,000
	c. Acoustical Ceil.	113,335 SF	25,925	77,775		103,700
	d. Acou. Wall Trmt.	767 SF	1,580	6,320		7,900
	e. Drywall Sub-Bond	LS			5,440	5,440
	f. Hard Tile					
	Ceramic Floor	3550 SF	5,135	15,405		20,540
	Ceramic Walls	8900 SF	13,146	27,934		41,080
	Marble Thresh.	40 EA	200	310		510
	Quarry Floor	8300 SF	18,734	30,566		49,300
	Quarry Base	1600 LF	2,147	3,503		5,650
	g. Terrazzo	23,800 SF	104,306	81,954		186,260
	h. Stage Floor	1980 SF	3,745	7,605		11,350
	i. Gym Floor	11,225 SF	25,045	50,850		75,895
	j. Painting					
	Walls	225,000 SF	21,255	43,155		64,410
	Epoxy	47,000 SF	5,751	10,679		16,430
	Structural	13,500 SF	2,704	5,251		7,955
	Doors/Frames	355 EA	4,078	21,412		25,490
	Ext. Spec. Coat	950 SF	322	653		975
	Graphics.	2000 LF	2,064	1,016		3,080
10	Specialties:					
	a. Chalk/Tackboard	145 EA	3,171	28,539		31,710
	b. Toilet Ptns.	61 EA	3,700	33,225		36,925
	c. Flagpole	1 EA	275	1,505		1,780
	d. Signage	359 EA	2,198	3,297		5,495
	e. Fire Ext. & Cab.	78 EA	1,296	7,349		8,645
	f. Tlt. Accessories	251 EA	1,845	11,725		13,570
	g. Canopies	8 EA	970	3,820		4,790
	h. Folding Partition	1 EA	250	1,670		1,920
TOTALS						

Submitted By: _____

Approved By: _____

Contractor _____

Architect _____

SUPPLEMENTAL DETAILED BREAKDOWN

Sheet 5 of 8 Sheets

NAME OF IMPROVEMENT _____

NO. OF IMPROVEMENT _____ CONTRACT PRICE _____

SCHOOL SYSTEM _____ LOCATION _____

Contractor's NAME AND ADDRESS _____

Spec. Div. No. (1)	Description Of Division (2)	Number & Kind Of Units (3)	Labor Costs Dollars (4)	Material Costs Dollars (5)	Other Costs Dollars (6)	Total Costs Dollars (7)
11	Equipment: a. Kitchen Equipment: Item #10 Item #13 Item #43	1 EA 1 EA 1 EA	100 100 200	2,320 4,340 6,255		2,420 4,440 6,455
12	Furnishings: Not Applicable					
13	Special Construction: a. Pre-Eng. Building b. Insulation	40,000 SF 46,400 SF	42,404 2,575	207,031 6,010		249,435 8,585
14	Conveying Systems: Not Applicable					
15	Mechanical: a: Plumbing b: Fire Protection c: HVAC				460,470 143,130 1,255,475	460,470 143,130 1,255,475
16	Electrical:				1,013,145	1,013,145
NOTES: NO LUMP SUMS ALLOWED EXCEPT AS EVIDENCED BY ATTACHED BREAKDOWNS. ALL WORK, INCLUDING SUBCONTRACTS, SHALL BE BROKEN DOWN IN UNIT COSTS.						
TOTALS			\$2,174,906	\$2,721,235	\$3,118,315	\$8,014,456

Submitted By _____

Approved By: _____

Contractor _____

Architect _____

SUPPLEMENTAL BREAKDOWN OF "PLUMBING"

Date _____

PERIODICAL ESTIMATE NO. _____

Item	Total Material Quantity	Unit Price Material Stored	Unit Price Material Installed	Total Material Installed	Material Installed to Date		Material Stored on Site	
					Quantity	Total	Quantity	Total
Water Meter								
Water Service Line								
Soil Pipe								
Soil Pipe Fittings								
Steel Pipe								
Steel Pipe Fittings								
Concrete Pipe & Fittings								
Valves								
Drains								
Down Spout								
Boots								
Insulation								
Fixtures								
Grease Traps								
Hot Water Boiler & Trim								
Hot Water Storage Tanks								
Breeching								
NOTES: NO LUMP SUMS ALLOWED. ALL WORK, INCLUDING SUBCONTRACTS, SHALL BE BROKEN DOWN IN UNIT COSTS.								
TOTAL CONTRACT PRICE								

Total Material Installed \$ _____
Material Stored on Site \$ _____
Total Amount Earned \$ _____
Less 10% retained \$ _____
Total earned less retained percentage \$ _____
Less Previous payments \$ _____
AMOUNT DUE THIS ESTIMATE \$ _____

(INSTRUCTIONS: The total contract price on this supplemental)
 (breakdown must agree in amount with the sum shown for plumbing)
 (on the initial breakdown of the Contractor.)

SUPPLEMENTAL BREAKDOWN OF "HEATING"

Date _____

PERIODICAL ESTIMATE NO. _____

Item	Total Material Quantity	Unit Price Material Stored	Unit Price Material Installed	Total Material Installed	Material Installed to Date		Material Stored on Site	
					Quantity	Total	Quantity	Total
Boiler								
Breeching								
Condensate Pump								
Gas Burner								
Convector								
Heating Controls								
Exhaust Fans								
Radiator Traps & Valves								
Gate Valves								
Pipe Fittings								
Steel & W.I. Pipe								
Insulation								
Outside Gas Line								
Pipe Hangers								
NOTES: NO LUMP SUMS ALLOWED. ALL WORK, INCLUDING SUBCONTRACTS, SHALL BE BROKEN DOWN IN UNIT COSTS.								
TOTAL CONTRACT PRICE								

Total Material Installed \$ _____
Material Stored on Site \$ _____
Total Amount Earned \$ _____
Less 10% retained \$ _____
Total earned less retained percentage \$ _____
Less Previous payments \$ _____
 AMOUNT DUE THIS ESTIMATE \$ _____

(INSTRUCTIONS: The total contract price on this supplemental)
 (breakdown must agree in amount with the sum shown for heating)
 (on the initial breakdown of the Contractor.)

SUPPLEMENTAL BREAKDOWN OF "ELECTRICAL"

Date _____

PERIODICAL ESTIMATE NO. _____

Item	Total Material Quantity	Unit Price Material Stored	Unit Price Material Installed	Total Material Installed	Material Installed to Date		Material Stored on Site	
					Quantity	Total	Quantity	Total
Conduit	17940 ft	.15	41.00	7,355.40				
Conduit Fittings, Condulets, etc.	47	2.18	2.75	129.25				
Conduit Locknuts & Bushings	2175	.03	.06	130.50				
Junction Boxes & Tele. Cabinets	4	5.20	20.00	80.00				
Bare & Insulated Wire & Cable	47775 ft	.04	.12	5,733.00				
Switches, Receptacles, Plates & Devices	499	.50	.70	349.30				
Outlet Boxes & Plaster Rings	590	.35	.45	265.50				
Lighting & Power Panels	8	259.84	395.00	3,160.00				
Breakers	3	222.67	320.00	960.00				
Lighting Fixtures	241	35.90	40.00	9,640.00				
Fire Alarm Equipment	26	12.47	21.00	546.00				
Clocks, Bells, Speakers, etc.	59	36.13	40.00	2,360.00				
Fuses	19	.06	.15	2.85				
Devices furnished by others	35		2.00	70.00				
Excavation & Backfill	970 ft	.06	.06	58.20				
Concrete	8 CY	20.00	20.00	160.00				

NOTES: NO LUMP SUMS ALLOWED.
ALL WORK, INCLUDING SUBCONTRACTS, SHALL BE BROKEN DOWN IN UNIT COSTS.

TOTAL CONTRACT PRICE				31,000.00			

Total Material Installed \$ _____

Material Stored on Site \$ _____

Total Amount Earned \$ _____

Less 10% retained \$ _____

Total earned less retained percentage \$ _____

Less Previous payments \$ _____

AMOUNT DUE THIS ESTIMATE \$ _____

(INSTRUCTIONS: The total contract price on this supplemental)
(breakdown must agree in amount with the sum shown for electrical)
(on the initial breakdown of the Contractor.)

**SECTION 00 2113
INSTRUCTIONS TO BIDDERS**

OWNER: **Walker County Board of Education**
201 South Duke Street;
PO Box 29
Lafayette, Georgia 30728
706-638-1240

PROJECT: Walker County Schools Hvac Modifications
Fairyland Elementary School &
Cherokee Ridge Elementary

ARCHITECT: James W. Buckley & Associates, Inc.
423 Pine Street, Suite 200
P.O. Box 466
Albany, Georgia, 31702

1.01 DEFINITIONS

- A. Bidding Documents include Advertisement or Invitation to Bid, Bidding Requirements, Instructions to Bidders, Bid Form, other sample bidding and contract forms, construction bond, and the proposed Contract Documents including any Addenda issued prior to receipt of Bids.
- B. All definitions set forth in General Conditions of the Contract for Construction or in other Contract Documents are applicable to Bidding Documents.
- C. Addenda: Written or graphic instruments issued by Architect prior to execution of Contract which modify or interpret Bidding Documents by addition, deletion, clarifications or corrections.
- D. Bid: Complete and properly signed proposal to do Work or designated portion thereof for sum stipulated therein supported by data called for by Bidding Documents.
- E. Base Bid: Sum stated in Bid for which Bidder offers to perform Work described as base, to which Work may be added or deducted for sums stated in Alternate Bids.
- F. Alternate Bid (or Alternate): Amount stated in Bid to be added to or deducted from amount of Base Bid if corresponding change in project scope or materials or methods of construction described in Bidding Documents is accepted.
- G. Unit Price: Amount stated in Bid as price per unit of measurement for materials or services described in Contract Documents.
- H. Bidder: One who submits Bid for prime contract with Owner for Work described in proposed Contract Documents.
- I. Sub-bidder: One who submits bid to Bidder for materials and labor for a portion of Work.
- J. **On-Site:** For the purposes of site grading activities and the application of unit cost allowances the term on-site shall be defined as the entire property/site on which the building(s) is/are located as defined by the site(s) property lines.
 - a. The site, for the purposes of this definition, is **not** limited to the area in which the work is being performed or any notations of the drawings regarding 'limits of work'

1.02 BIDDER'S REPRESENTATION

- A. Each Bidder by making his bid represents that: He has carefully reviewed the contract documents and found the documents to be complete and if not found to be complete, have notified Project Architect of missing drawings and/or specification sections or pages.
 - 1. He has carefully read and understands the Bidding Documents and his Bid is made in Accordance therewith.
 - 2. He acknowledges an understanding of the documents for other portions of Project being bid concurrently.
 - 3. He is required to carefully compare Bidding Documents with each other and with other work being bid concurrently or presently under construction.
 - 4. He has visited site and familiarized himself with local conditions under which Work is to be performed.
 - 5. His Bid is based upon materials, systems and equipment described in Bidding Documents without exception.

1.03 BIDDING DOCUMENTS

- A. Copies: Bidders may obtain from Architect, complete sets of Bidding Documents in number and for deposit sum stated in Advertisement or Invitation. Bid documents obtained from sources other than Architect shall not be considered as suitable for bidding purposes.
 - 1. Deposit for one set refunded on return of deposit sets in good condition within 10 days after bid time by General Contractor submitting bonafide bid. For treatment of other deposits refer to Invitation to Bid, Section A.
 - 2. Deposits not refunded for deposit sets returned prior to bid.
 - 3. Deposits refunded on Bid Documents returned in good condition, within prescribed period of time only. "Good Condition" shall be defined as Bid Documents returned in essentially the same condition as delivered to the contractors. Plans shall not have been disassembled, defaced, marred, marked or otherwise damaged.
 - 4. Bidder receiving contract award may retain Bidding Documents.
- B. Use **ONLY COMPLETE** sets of Bidding Documents in preparing bids; neither Owner or Architect assume any responsibility for errors or misinterpretations resulting from use of incomplete sets of Bidding Documents.
- C. Owner or Architect in making copies of Bidding Documents available on above terms, do so only for purpose of obtaining bids on Work and do not confer license or grant for any other use.

1.04 ELECTRONIC DOCUMENTS:

- A. Electronically formatted plans may, *at the architect's sole discretion*, be made available to the contractor(s) for use in developing bids. Should the architect determine that the use of electronic documents will be allowable in the development of bids, the following conditions shall apply:
 - 1. The recipient agrees to bound to the requirements contained herein and in the form of agreement for the electronic transfer. The opening, distribution and/or use of the electronic documents shall be considered as an acceptance of these conditions.
 - 2. Governing Documents: The hard copies (blue line or black line) of plans and specifications printed and maintained by the architect in the architect's office shall be considered to be the contract documents. If conflicts exist between the electronic documents and the hard copy of the contract documents maintained in the architect's office, the hard copy shall govern.
 - 3. The delivery of electronic documents to the contractor shall in no way be construed as changing the contract documents.
 - 4. Electronic data, if furnished, shall be provided to the contractor as a convenience to the contractor. Such delivery of electronic documents shall in no way eliminate or reduce the contractor's traditional and/or contractual responsibilities.
 - 5. Waiver of Liability: The contractor agrees to hold the Owner, architect and engineers harmless for any claims resulting from the use of the electronic documents regardless of the nature of the claim or the use of the electronic data.

- a. The opening, distribution or use of electronic documents, by contractor(s), subcontractor(s), supplier(s) or other parties (recipients) shall be construed as and agreement to hold the Owner, architect and engineers harmless for any issues, claims, delays, or damages resulting from the use of such documents
 - b. The recipient shall waive all claims and/or damages against the Owner, architect and or engineers relating to corruption, degradation or disruption of data.
 - c. Recipient of electronic data shall defend and indemnify the Owner, architect and engineer(s) from any claim arising from any defect, error, omission or modifications not contained in the hardcopies of the contract documents.
6. Copy Right of Documents: The delivery of electronic documents to parties shall not be construed as authorization to use, copy or distribute electronic documents for any other use than that which is indicated herein and as defined in the agreement for transfer of electronic documents.
- a. The architect expressly retains ownership of documents and copyright of said documents.
7. No Warranties on Accuracy of Electronic Documents: The architect and engineers do not in any way warrant that the plans and/or specifications are identical to the contract documents. If conflicts exist between the printed contract documents and the electronically formatted documents the printed documents shall govern
8. No Warranty as to Fitness: The recipient agrees that the electronic documents are an 'instrument of service' and not a 'product'. The architect and engineers in no way warrant the merchantability or fitness of the electronic documents. The architect expressly disavows any and all warranties whether expressed or implied regarding the accuracy of the electronic documents or the fitness of the documents for the intended use by the recipients.
9. Electronic Document Format: Should the architect determine that the use of electronic documents will be allowed in the development of bids, such documents will be furnished in **.pdf format** only. The documents will not be issued in the originally developed formats (Word, Word Perfect, AutoCad, Revit).

1.05 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

- A. Bidders promptly notify Architect of any ambiguity, inconsistency or error discovered upon examination of Bidding Documents or of site and local conditions.
- B. Bidders requiring clarification or interpretation of Bidding Documents make written request to Architect, to reach him at least ten (10) days prior to date for receipt of bids.
 1. Request for clarifications, either written or verbal (telephonic) shall be directed to Mr. Greg Smith, Project Architect at (229)-883-4698 **ONLY**.
 2. Clarifications from other parties shall not be considered binding.
- C. Any interpretation, correction or change of Bidding Documents made only by Addendum.
 1. Interpretations, corrections or changes of Bidding Documents made in any other manner are not binding, and bidders give no reliance upon such interpretations, corrections and changes.

1.06 FIELD VISITATION

- A. Prior to submission of bid each potential bidder SHALL visit the project site and examine existing conditions which may affect the work required to be performed under this contract.
- B. Claims by successful bidder for additional monies or time required due to factors which should have been discernable from thorough field visits to each site will not be considered.

1.07 INFORMATION AVAILABLE TO BIDDERS

- A. Contractors are advised that, in addition to the documents provided to each of the bidders, certain additional documents are available which may assist the bidder in the preparation of the bid(s).
 1. These documents are made available for the contractor's convenience.
 2. Potential bidders are encouraged to review these documents.
 3. Documents are available in the Architect's and / or owner's office.

- B. Failure of bidder to consider information available in documents described above shall not be grounds for a future change order.

1.08 SUBSTITUTIONS

- A. Materials, products and equipment described in Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.
- B. No substitution considered unless written request for approval submitted by Bidder and received by Architect at least ten (10) days prior to date for receipt of bids.
 - 1. Include in each such request:
 - a. Name of material or equipment for which substitution requested.
 - b. Complete description of proposed substitute, including drawings, cuts, performance and test data
 - c. Any other information necessary for evaluation.
 - 2. Include statement setting forth any changes in other materials, equipment or work incorporation of substitute would require.
 - 3. Burden of proof of merit of proposed substitute is upon proposer.
 - 4. Architect's decision of approval or disapproval of proposed substitution is final.
- C. If Architect approves any proposed substitution, such approval set forth only in Addendum; do not rely upon approvals made in any other manner.
 - 1. Approval of Substitutions shall be written Addendum, issued prior to receipt of bids, Only.
 - 2. Verbal approval shall not be considered binding regardless of parties issuing approval.
 - 3. Suppliers of disapproved products will **NOT** be individually notified of disapproval.

1.09 ADDENDA

- A. It is the responsibility of each bidder presenting a bid to confirm with the Architect they have received all addenda. The contact person for confirmation of addenda is Gregory C. Smith at (229) 883-4698 or by fax at (229) 883-0936.
 - 1. Bidder shall ascertain prior to submitting his bid that he has received all Addendum issued, and acknowledge their receipt in his bid.
- B. Addenda will be E-mailed, mailed or delivered to all who are known by Architect to have received complete set of Bidding Documents from the architect.
 - 1. Copies of Addenda made available for inspection wherever Bidding Documents on file for that purpose
- C. Any explanation desired by a bidder regarding ambiguity, meaning, or interpretation of any portion of this Bid Document must be presented in writing to Gregory C. Smith, James W. Buckley & Associates, Inc., PO Box 466, 423 Pine Avenue, Suite 200, Albany, Georgia 31701; Phone 229-883-4698; Fax 229-883-0936; E-mail gcs@jwbuckley.com.
- D. A request for information must be received before by no later than five working days prior to the bid date in order to allow sufficient time to reply to all bidders before the deadline for submission of bids. Such explanations given to a bidder concerning this request for information will be furnished to all bidders as addenda.

1.10 FORM AND STYLE OF BIDS

- A. Submit bids in duplicate on forms indicated by Architect.
- B. Fill in all blanks on bid form by typewriter or manually in ink.
- C. Where so indicated by makeup of bid form, express sums in both words and figures, and in case of discrepancy between the two, amount expressed in words governs.
- D. Signer of Bid must initial any interlineation, alteration or erasure.

- E. Bid all requested alternates.
- F. Make no stipulations on bid form nor qualify bid in any manner.
- G. Include legal name of Bidder on each copy of Bid and state whether Bidder is a sole proprietor, partnership, corporation, or any other legal entity, and person or persons legally authorized to bind the Bidder to a contract sign each copy.
 - 1. If Bid submitted by corporation, give State of incorporation and affix corporate seal.
 - 2. If Bid submitted by an agent, attach current Power of Attorney certifying agent's authority to bind Bidder.

1.11 BID SECURITY

- A. If so stipulated in Advertisement or Invitation to Bid or Bidding Requirements, accompany each Bid with a bid security in required form and amount pledging that Bidder will enter into contract with Owner on terms stated in his Bid and will, if required, furnish bonds as described hereunder covering faithful performance of Contract and payment of all obligations arising thereunder.
 - 1. Should Bidder refuse to enter into such Contract or fail to furnish such bonds, if required, amount of bid security forfeited to Owner as liquidated damages, not as penalty.
- B. Bid security: In form of bid bond only; certified check or cashier's check not acceptable.
- C. Submit bid bond, written in form acceptable to Owner, with an acceptable surety, and Attorney-in-Fact who executes bond on behalf of surety affix to bond a certified and current copy of his Power of Attorney.
 - 1. Surety shall be licensed to conduct business in the state of Georgia.
 - 2. Surety shall be approved by the office of the Georgia Insurance Commissioner.
 - 3. Surety shall be listed in the most recent edition of the **FEDERAL REGISTER**.
- D. Owner reserves right to retain bid security of Bidders until one of following occurs:
 - 1. Contract executed and bonds, if required, furnished.
 - 2. Specified time elapsed so that Bids may be withdrawn
 - 3. All Bids rejected.

1.12 UNIT PRICES

- A. The Base Bids for this project shall include the total cost of items listed below as defined by the contract documents. Should conditions be encountered which required work to be performed beyond that defined in the contract, such work will be performed utilizing unit costs listed below applied to field determined quantities. This form shall be completed in its entirety.
 - 1. Unit Costs shall be used for changing quantities of work items from those indicated by the Contract Drawings.
- B. Unit prices shall include all labor, materials, overhead, profit, insurance, etc. to cover finished work of several kinds called for.
 - 1. Unit prices shall include required engineering, surveying, and testing.
 - 2. Where applicable unit costs shall include related work activities necessary to complete work.
 - 3. No additional surcharges shall be added to unit prices.
- C. Should changes to the contract quantities be requested a change order will be issued for modified scope based on unit costs contained herein.
- D. All unit prices indicated on the Bid Proposal form shall be bid.
 - 1. Only unit prices that are within the normal costs of work or materials being provide will be acceptable. If the unit prices are deemed to be unreasonable, the Owner may deem the bidder non-responsive and proceed to the next lowest bidder.
 - 2. All unit price quantities shall be agreed upon by the Contractor and the Architect.\
 - 3. The Owner and/or architect reserve the right to negotiate any unit prices considered to be unreasonable or excessive.

- E. Where unit prices used to adjust the contract cost, the quantities of materials (unsuitable soil, rock, ect) removed and replaced shall be determined by and independent land surveyor approved by the architect. The costs for the survey to be used for the quantifying of materials shall be paid by the contractor and included in the unit cost; unless otherwise noted.

1.13 BID BOND INSTRUCTIONS

- A. Prepare two copies of Bid Bond, one for Owner and one for Surety.
- B. Type or print Bidder's and Surety's names in indicated blanks.
- C. Date Bond prior to date of Bid Opening.
- D. Type or print description of construction in same language as in Advertisement or Invitation to Bid.
- E. Complete signatures on form.
 - 1. Corporate bidder affix corporate seal and sign in following manner:

ABC Construction Company

BY: _____
As President
- F. Affix Surety's corporate seal.
- G. Attach copy of Surety's agent's power of attorney.
 - 1. Copy of power of attorney must have original signature of Secretary or Assistant Secretary of Surety certifying copy.
 - 2. Affix Surety's corporate seal.

1.14 SUBMISSION OF BIDS

- A. Enclose all copies of Bid, and any other documents required to be submitted with Bid except bid security, if any, in sealed opaque envelope addressed to party receiving Bids and identified with Project name, Bidder's name and address, and portion of project or category of work for which Bid submitted.
- B. If bid security is required, enclose it, along with envelope containing Bid, in outer envelope and identify in similar manner.
- C. If Bid mailed, enclose outer sealed envelope in separate mailing envelope with notation "BID ENCLOSED" on face thereof.
- D. Deposit bids at designated location prior to time and date for receipt of bids indicated in Advertisement or Invitation to Bid, or any extension thereof made by Addendum.
 - 1. Bids received after time and date for receipt of bids returned unopened.
- E. Bidder assumes full responsibility for timely delivery at location designated for receipt of bids.
- F. Oral, telephonic or telegraphic Bids are invalid and receive no consideration.

1.15 CONTRACTOR LICENSE:

- A. Contractor License: Contractor shall be licensed in the State of Georgia in accordance with applicable licensing laws. Contractor to submit, as a part of bid proposal, a copy of the contractor(s) current state license. Failure to submit the license may subject the bid to rejection.

1.16 UTILITY CONTRACTOR NAME AND LICENSE

- A. Utility Contract License: Site utility work to be performed by contractor(s) licensed as utility contractor by the State of Georgia in accordance with Code Section 43-14-8.2. Provisions of this section apply to electrical contractors, plumbers, Hvac contractors, low voltage and utilities systems contractors as well as other contractors defined within the State of Georgia Code.

1.17 GEORGIA IMMIGRATION AND SECURITY REFORM ACT:

- A. Contractor(s) performing work on this project are subject to the requirements of the Georgia Security and Immigration Compliance Act of 2006; Chapter 300-10-1 of O.C.G.A.
- B. Contractor(s) and Sub-Contractor(s) shall verify that all trades on-site comply with applicable requirements. Submit documentation of compliance to the Owner prior to commencement of work by any trade.
- C. Pursuant to O.C.G.A. 13-10-91, every public employer, every contractor of a public employer, and every subcontractor of a public employer's contractor must register and participate in a federal work authorization program.
- D. The EEV / Basic Pilot Program can be accessed from the USDHS U.S. Citizenship and Immigration Services Internet website at <https://www.visdhs.com/EmployerRegistration>. Information and instructions regarding EEV / Basic Pilot Program Registration, Corporate Administrator Registration, and Designated Agent Registration can be found at that website address
- E. Contractor(s) performing work on this project are subject to the requirements of the Georgia Immigration and Security Reform Act.
 - 1. Contractor to verify that all trades on site comply with applicable requirements.
 - 2. Submit documentation of compliance to architect prior to commencement of work by any trade.
- F. Georgia Security and Immigration Compliance Act: The Contractor is to verify its compliance with O.C.G.A. § 13-10-91 for each subcontractor and each on-site operative, stating affirmatively that the individual, firm, or contractor who is contracting with the Owner or with successful bidder is participating in a federal work authorization program [Employment Eligibility Verification (EEV) operated by the U.S. Citizens and Immigration Services Bureau of the U. S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA)] in accordance with the applicability provisions and deadlines established in O.C.G.A. § 13-10-91 for portions of this contract.
 - 1. Provide EEV (Employment Eligibility Verification) User identification number.
 - 2. Complete attached form and include as part of submittal.

1.18 MODIFICATION OR WITHDRAWAL OF BID

- A. Bid may not be modified, withdrawn or canceled by Bidder during stipulated time period following time and date designated for receipt of Bids, and Bidder so agrees in submitting his Bid.
- B. Prior to time and date designated for receipt of Bids, modification or withdrawal of Bids submitted early permitted only by notice to party receiving Bids at place and prior to time designated for receipt of Bids.
 - 1. Submit such notice in writing over signature of Bidder or be by telegram, and if by telegram, written confirmation over signature of Bidder must be mailed and postmarked on or before date and time set for receipt of Bids,
 - 2. So word such notice as not to reveal amount of original Bid.
- C. Withdrawn Bids may be resubmitted up to time designated for receipt of Bids provided they are then fully in conformance with these Instructions to Bidders.
 - 1. Provide Bid security, if any is required, in an amount sufficient for Bid as modified or resubmitted.

1.19 CONSIDERATION OF BIDS

- A. Opening of Bids: Unless stated otherwise in Advertisement, properly identified Bids received on time will be opened publicly and read aloud, and an abstract of amounts of Base Bids and major Alternates, if any, made available to bidders.
 - 1. When stated that Bids will be opened privately, an abstract of same information may be made available to Bidders within a reasonable time.
- B. Rejection of Bids:
 - 1. Owner has right to reject any or all Bids and in particular to reject:
 - a. Bid not accompanied by required bid security or data required by Bidding Documents.
 - b. Bid in any way incomplete or irregular.
 - 2. The Owner reserves the right to reject the bid of any bidder who has previously failed to perform properly, or to complete on time, contracts of a similar nature; who is not in a position to perform the contract, or who habitually and without just cause neglected the payment of bills or otherwise disregards his obligations to subcontractors, material men, or employees.
- C. Acceptance of Bid (Award):
 - 1. Owner has right to waive any informality or irregularity in any Bid received.
 - 2. Owner will accept deductive alternates in order they are listed and will determine low Bidder on basis of Base Bid less accepted alternates.
 - 3. Owner has right to accept additive alternates in any order or combination.
 - 4. Owner intends to award contract to lowest responsible Bidder provided Bid submitted in accordance with requirements of Bidding Documents, is judged reasonable, and does not exceed funds available.
 - 5. If Contract is awarded, award made within 60 days of date of bid opening.

1.20 QUALIFICATION OF BIDDERS

- A. Bidders submit to with his bid, a properly executed Contractor's Qualification Statement, in form provided.

1.21 LIST OF SUBCONTRACTORS

- A. Selected Bidder submit to Owner within 48 hours of notification of award, list of subcontractors and major materials suppliers used if awarded Contract.
- B. Upon request, selected Bidder required to submit as soon as practical, after notification of award, all data required to establish to satisfaction of Architect and Owner, the reliability and responsibility of proposed Subcontractors to furnish and perform Work described in Sections of Specifications pertaining to such proposed Subcontractor's respective trades.
- C. Subcontractors proposed for Mechanical and Electrical Work must show evidence of at least two jobs of similar character and size installed within preceding two years.
- D. Prior to award of Contract, Architect will notify Bidder in writing if either Owner or Architect, after due investigation, has reasonable and substantial objection to any person or organization on such list.
 - 1. If Owner or Architect has reasonable and substantial objection to any person or organization on such list, and refuses in writing to accept such person or organization, bidder may, at his option, withdraw his bid without forfeiture of bid security or submit an acceptable substitute at no increase in Bid price.
 - 2. If Bidder fails to submit an acceptable substitute within seven (7) days of original notification, Owner then may, at his option, disqualify bidder, at no cost to Owner.
- E. Utilize only Subcontractors and other persons and organizations proposed by bidder, and accepted by Owner and Architect, on the Work for which they were proposed and accepted and do not change except with written approval of Owner and Architect.

1.22 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

- A. Required Bonds: Bidder furnish bonds covering faithful performance of Contract and payment of all obligations arising thereunder in full amount of Contract, with such acceptable sureties secured through Bidder's usual sources as agreeable to parties.
- B. Surety Bond: Acceptable Surety Companies: To be acceptable to Owner as Surety on Bonds, Surety comply with following provisions:
 - 1. Be licensed to do business in Georgia.
 - 2. Have been in business with record of successful continuous operations for at least five years.
 - 3. Have financial rating acceptable to Owner.
 - 4. Not expose itself to any loss on any one risk in amount exceeding twenty percent of its surplus to policy-holders.
 - 5. Fulfilled all of obligations on all other bonds given to Owner.
- C. Time of Delivery and Form of Bonds:
 - 1. Bidder deliver required bonds to Owner with executed Contract, or if Work commenced prior thereto in response to letter of intent, Bidder, prior to commencement of Work, submit evidence satisfactory to Owner that such bonds will be furnished.
 - 2. Unless otherwise specified in Bidding Documents, write bonds in form of those bound in this Project Manual.
 - 3. Bidder require Attorney-in-Fact who executes required bonds on behalf of surety to affix thereto a certified and current copy of his Power of Attorney.
 - 4. Date all bonds on or after date of Contract.

1.23 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

- A. Agreement Form: Unless otherwise provided in Bidding Documents, Agreement for Work will be written on Form of Agreement between Owner and Contractor as bound in this Project Manual.
- B. Contractor Indemnity: The Contractor agrees to indemnify and hold harmless the Owner and the Architect from any liabilities, damages and costs (including reasonable attorney's fees) to the extent caused by the negligent acts, errors or omissions of the Contractor, its subcontractors, or anyone for whom Contractor is legally responsible.

1.24 CONTRACT TIME

- A. Following is made part of Contract:

"The work to be performed under this Agreement shall be commenced within ten (10) days of receipt of notice to proceed, in writing, and substantially completed within the time set in the Bidders proposal.

1.25 SCHEDULE

- A. If the Contractor fails to commence actual physical work with an adequate force and equipment within ten (10) days of the date specified in the written Notice to Proceed, the Owner reserves the right to null and void the Contract Award.
- B. Contractor shall notify the Engineer and Owner in writing before any billable work takes place.

1.26 TAXES

- A. Project is subject to Federal Excise and Georgia Sales Taxes, and must be included in Bidder's proposal.
 - 1. Contractor shall pay all applicable taxes.

1.27 VENDOR PERFORMANCE

- A. The successful bidder shall be required to truly perform well and fulfill all the undertakings, covenants, terms, conditions, and agreements of the contract. The successful bidder and his employees shall have the current federal, state, and local licenses, permits, and certificates required to perform their work.
- B. The successful bidder shall provide trained and properly licensed personnel having available the appropriate types of tools, and equipment to complete the project in a professional manner.

1.28 INCURRING COSTS

- A. The Owner is not liable for any costs incurred by bidder in preparing or submitting proposals.

1.29 PERMITS AND FEES

- A. Surveys, Permits and Regulations: Paragraph (a): Permits: Per Georgia Code 20-2-261(d) a Local Board of Education shall be exempt from county and municipal assessments and fees for county and municipal permits and inspections and exempt from county and municipal impact fees.
 - 1. Cost for County building permits and impact fees to be excluded from the contractors bid.
 - 2. Contractor responsible for other fees, including tap fees, not specifically identified above, unless noted otherwise in the contract documents.
- B. Contractor to obtain necessary and required building permits.
- C. The contractor shall be responsible for the filing of the 'notice of intent' as required for the erosion control permit.

1.30 PRODUCT AND QUALITY ASSURANCE:

- A. All products and/or parts required by this contract shall be in accordance with the specifications. The Owner reserves the right to reject any products and/or parts that they deem not to meet the basis of design and/or the project specifications.

1.31 MATERIAL SAFETY DATA SHEETS AND TECHNICAL DOCUMENTATION:

- A. The successful bidder shall submit copies of MSDS's on all chemicals that may be utilized to perform the work associated with this RFQ. The Owner and architect shall approve the MSDS's for each product, prior to its use. Provide technical data sheets (shop drawings) on all new chemicals utilized, prior to their use.

1.32 EXPERIENCE DOCUMENTATION:

- A. The successful bidder shall have a minimum off five (5) years experience in the industry under the present company name. The successful bidder shall submit a copy of current licenses, permits, certifications, and proof of training for employees performing work associated with this contract.

1.33 CHANGES

- A. The Owner may order changes in the schedule, work, and/or materials consisting of additions, deletions, or modifications. The contract sum and the contract time will be adjusted accordingly. All such changes shall be authorized by a written change order, signed by the Owner, prior to its performance.
- B. The Owner reserves the right to identify and negotiate reductions or changes by the successful bidder which would be to the advantage of the Owner. The cost or credit to the Owner from a change in the work and/or material consisting of additions, deletions, or modifications shall be determined by mutual agreement.

1.34 PROMPT PAY ACT

- A. The contractor(s) is (are) hereby notified that the Contract Documents shall take precedence over All provisions of the PROMPT PAY ACT.
- B. Should conditions be encountered where the provisions of this contract are found or believed to be in conflict with the provisions of the Prompt Pay Act, the provisions of this contract shall govern.

1.35 SEVERABILITY: If any portion of the contract documents shall be held to be invalid or unenforceable for any reason, the remaining provisions of the contract documents shall continue to be valid and enforceable. If a court finds that any provision of the contract documents is invalid or unenforceable, but that by limiting such provision it would become valid and enforceable, then such provision shall be deemed to be written, construed, and enforced as so limited.

1.36 WAIVER: The failure of either party to enforce ant provisions of the contract documents shall not be construed as a waiver or limitation of that party’s right to subsequently enforce and compel strict compliance with every provision of the contract documents.

1.37 POLICIES STATEMENTS

- A. Non-Bias Statement: The Local Board of Education supports all Federal, State and Local equal opportunity policies. Bias related activities, including, but not limited to, discrimination, racial slurs, sexual harassment will not be tolerated.
- B. Drug Free/Tobacco Free Statement: The Local County Board of Education supports a drug free work place and does not tolerate any use or possession of drugs and/or alcohol on its premises or use of such substances prior to performing any work on behalf of the Board of Education. Use of tobacco is prohibited in all buildings and all premises of the Board of Education.
- C. Local Business: Contractors shall note that the Owner supports local business enterprises.

1.38 SAFE SCHOOL STATEMENT

- A. Individuals working within a school building, or on a school site, to submit to a background check pertaining to felony convictions and sex offender convictions. Violent felons and sex offenders shall not be allowed within a school building or on a school site while school staff or students are in the building or on the site. Convicted predatory sex offenders shall not be allowed on property at any time. All decisions made in this effort to promote a safe school environment shall be accessed at the sole discretion of the Owner and Architect.

1.39 DEFAULT BY A CONTRACTOR:

- A. In the event goods and/or services furnished under this contract, for any reason, do not conform to the intent of this contract document and/or any terms agreed upon prior to the award of the contract, the Owner/architect may reject the goods and/or services. Following specific instructions by the Owner/Architect, the successful bidder shall immediately remove the goods and/or cease providing the services, without expense to the Owner and replace all rejected goods and/or services with goods and/or services conforming to the contract documents and/or terms agreed upon.
- B. Should the contractor default in the performance of the previous paragraph, Owner shall issue, within forty-eight (48) hours, written notice detailing the default. The Owner has the right to procure such goods and/or services from other sources and shall have the absolute right to deduct from any monies due to the contractor, the difference between the contract price and the actual cost of the goods and/or services to be replaced or substituted. The price paid by the Owner in this event shall be the prevailing market price at the time the substitute purchase is made.

1.40 RELEASE OF LIABILITY:

Walker County Schools Hvac Modifications
Fairyland Elementary School &
Cherokee Ridge Elementary

- A. It is expressly understood that the Owner and Architect shall not be liable to any Contractor and that said Contractor will hold harmless Owner and Architect, its officers, employees and agents from any loss, damage, expense or liability by reason of property damage, excluding loss of use thereof, or personal injury of whatsoever nature of any kind (including death) arising out of or in connection with the performance and installation work pursuant to this bid or any special contract resulting from this bid by Contractor occasioned by the negligent acts or omissions of employees, officers or agents of Contractor.

1.41 ATTACHMENTS

Attachments A, B, C, D, E and F are hereby incorporated by their reference into the contract documents.

END OF SECTION 00 2113

ATTACHMENT A

VENUE AND JURISDICTION

PROJECT: _____

OWNER: _____

CONTRACTOR: _____

Contractor agrees that with respect to any claims which the Owner may have against the Contractor arising out of this contract or its performance or on account of any work done under or pursuant to the Contractor for indemnity shall be controlled and governed by law of Georgia, and actions pursuant to any such claims may be filed and prosecuted against the Contractor in the courts of the County in which the project is located. For this purpose, the Contractor does hereby waive all questions of venue and jurisdiction and does hereby submit itself to the venue and jurisdiction of the courts of the county in which the project is located.

Contractor further agrees that any claims for personal injury and/or property damage which any person may have against the Contractor arising out of this contract or its performance or on account of any work done under or pursuant to the contract shall be controlled and governed by the law of Georgia, and actions pursuant to any such claims may be filed and prosecuted against the Contractor does hereby waive all questions of venue and jurisdiction and does hereby submit itself to the venue and jurisdiction of the county in which the project is located.

Contractor does hereby appoint: _____

a resident of the county in which the project is located as its agent to receive service of any such actions, and service upon such agent shall be good and valid service upon the Contractor. Service may be perfected upon the Contractor by serving its agent or the Judge of Probate Court of the county in which the project is located, and such service shall in all respect be good and valid service of said action upon the Contractor. It shall be the obligation of the Contractor to keep its agent for service and the Judge of Probate Court of the county in which the project is located informed and advised of all times of the address to which any such suits served upon them shall be sent.

Signed: _____ Title: _____

This _____ day of _____, 20_____.

Notary Public: _____

_____ County, Georgia

My commission expires

ATTACHMENT B

300-10-1-.02 Public Employers, Their Contractors, and Subcontractors Required to Verify New Employee Work Eligibility Through a Federal Work Authorization Program.

(1) Pursuant to O.C.G.A. 13-10-91, every public employer, every contractor of a public employer, and every subcontractor of a public employer's contractor must register and participate in a federal work authorization program, as follows:

(a) On or after July 1, 2007, every public employer shall register and participate in a federal work authorization program to verify the work eligibility information of all new employees.

(b) No public employer shall enter into a contract for the physical performance of services within this state unless the contractor registers and participates in a federal work authorization program to verify the work eligibility information of all new employees.

(c) No contractor or subcontractor who enters into a contract with a public employer shall enter into such a contract or subcontract in connection with the physical performance of services within this state unless such contractor or subcontractor registers and participates in a federal work authorization program to verify the work eligibility information of all new employees.

(2) In accordance with O.C.G.A. 13-10-91, the requirements of paragraphs (b) and (c) of paragraph (1) shall apply to public employers, their contractors and subcontractors, as follows:

(a) On or after July 1, 2007, to public employers, contractors, or subcontractors of 500 or more employees;

(b) On or after July 1, 2008, to public employers, contractors, or subcontractors of 100 or more employees; and

(c) On or after July 1, 2009, to all other public employers, their contractors, or subcontractors.

(3) As of the date of enactment of O.C.G.A. 13-10-91, the applicable federal work authorization program is the "Employment Eligibility Verification (EEV) / Basic Pilot Program" operated by the U. S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA). Public employers, contractors and subcontractors subject to O.C.G.A. 13-10-91 shall comply with O.C.G.A. 13-10-91 and this rule by utilizing the EEV / Basic Pilot Program. The EEV / Basic Pilot Program can be accessed from the USDHS U.S. Citizenship and Immigration Services Internet website at <https://www.vis-dhs.com/EmployerRegistration>. Information and instructions regarding EEV / Basic pilot Program Registration, Corporate Administrator Registration, and Designated Agent Registration can be found at that website address.

(4) All rules, regulations, policies, procedures and other requirements of the EEV / Basic pilot program or any other federal work authorization program defined in Rule 300-10-1-.01 and permitted to be used to satisfy the requirements of O.C.G.A. 13-10-91 and these rules, shall be considered additional requirements of this rule.

(5) In accordance with O.C.G.A. 13-10-91, public employers, contractors, and subcontractors may utilize any other federal work authorization program operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603, as such work authorization programs become available.

(6) A copy of these Chapter 300-10-1 rules, including any forms prescribed or available to administer and effectuate these rules, shall be published on the Georgia Department of Labor's website.

(7) In accordance with the provisions of O.C.G.A. 13-10-91, these rules in Chapter 300-10-1 do not apply to any contract or agreement relating to public transportation. Rules and forms applicable to any contract or agreement relating to public transportation may be found on the Georgia Department of Transportation's website.

(8) The rules of Chapter 300-10-1 shall be enforced without regard to race, religion, gender, ethnicity, or national origin.

Authority O.C.G.A. Sec. 13-10-91. **History:** Original Rule entitled "Public Employers, Their Contractors, and Subcontractors Required to Verify New Employee Work Eligibility Through a Federal Work Authorization Program" adopted. F. May 25, 2007; effective June 18, 2007, as specified by the Agency.

ATTACHMENT C

GEORGIA SECURITY AND IMMIGRATION COMPLIANCE ACT of 2006

CONTRACTOR AFFIDAVIT AND AGREEMENT

COMES NOW before me, the undersigned officer duly authorized to administer oaths, the undersigned Contractor, who, after being duly sworn, states as follows:

By executing this affidavit, the undersigned Contractor verifies its compliance with O.C.G.A. § 13-10-91 and Georgia Department of Labor Rule 300-10-1 et al, stating affirmatively that the individual, firm, or corporation which is contracting with the **Owner; City**, Georgia, has registered with and is participating in a federal work authorization program* [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. § 13-10-91 and Georgia Department of Labor Rule 300-10-1-.02.

The undersigned Contractor further agrees that, should it employ or contract with any Sub-Contractor(s) in connection with the physical performance of services pursuant to the contract with the **Owner; City**; Georgia, of which this affidavit is a part, the undersigned Contractor will secure from such Sub-Contractor(s) similar verification of compliance with O.C.G.A. § 13-10-91 and Georgia Department of Labor Rule 300-10-1-.02 through the Sub-Contractor's execution of the Sub-Contractor Affidavit required by Georgia Department of Labor Rule 300-10-1-.08, or a substantially similar Sub-Contractor Affidavit.

The undersigned Contractor further agrees to maintain records of such compliance and provide a copy of each such verification to the **Owner, City**, Georgia at the time the Sub-Contractor(s) is retained to perform such service.

EEV / Basic Pilot Program* User Identification Number: _____

Company Name: _____

Address: _____

City: _____ State: _____ ZIP: _____

Name: _____ Title: _____

Signature: _____ Date: _____

Notary Public: _____, _____ County, Georgia.

This _____ Day of _____, 20____. My Commission Expires: _____

* As of the effective date of O.C.G.A. § 13-10-91, the applicable federal work authorization program is the "EEV / Basic Pilot Program" operated by the U.S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).

ATTACHMENT D

GEORGIA SECURITY AND IMMIGRATION COMPLIANCE ACT of 2006

SUB-CONTRACTOR AFFIDAVIT

COMES NOW before me, the undersigned officer duly authorized to administer oaths, the undersigned Sub-Contractor, who, after being duly sworn, states as follows:

By executing this affidavit, the undersigned Sub-Contractor verifies its compliance with O.C.G.A. § 13-10-91 and Georgia Department of Labor Rule 300-10-1 et al, stating affirmatively that the individual, firm, or corporation which is engaged in the physical performance of services under a Contract with _____, Contractor, on behalf of the **Owner, City**, Georgia, has registered with and is participating in a federal work authorization program* [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. § 13-10-91 and Georgia Department of Labor Rule 300-10-1-.02.

EEV / Basic Pilot Program* User Identification Number: _____

Company Name: _____

Address: _____

City: _____ State: _____ ZIP: _____

Name: _____ Title: _____

Signature: _____ Date: _____

Notary Public: _____, _____ County, Georgia.

This _____ Day of _____, 20____. My Commission Expires: _____

* As of the effective date of O.C.G.A. § 13-10-91, the applicable federal work authorization program is the "EEV / Basic Pilot Program" operated by the U.S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).

ATTACHMENT E

GEORGIA SECURITY AND IMMIGRATION COMPLIANCE ACT AFFIDAVIT

Project Name and Number

Contractor's Name: _____

CONTRACTOR AFFIDAVIT

By executing this affidavit, the undersigned Contractor verifies its compliance with O.C.G.A. §13-10-91, stating affirmatively that the individual, firm, or corporation which is contracting with the **Owner** has registered with and is participating in a federal work authorization program*, in accordance with the applicability provisions and deadlines established in O.C.G.A. 13-10-91.

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

EEV / E-Verify™ User Identification Number

Date of Authorization

BY: Authorized Officer or Agent
(Contractor Name)

Date

Title of Authorized Officer or Agent of Contractor

Printed Name of Authorized Officer or Agent

SUBSCRIBED AND SWORN
BEFORE ME ON THIS THE

____ DAY OF _____, 201__

[NOTARY SEAL]

Notary Public

My Commission Expires: _____

*any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees,

pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603

ATTACHMENT F
AFFIDAVIT OF NON-COLLUSION

STATE OF GEORGIA

COUNTY OF _____

Personally appeared before me, _____, who being first duly sworn says that he is a member of the firm of: _____ and further says that his firm, association, or corporation has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the submission of a bid on the above-name project.

Further, _____ swears and affirms that all legal formalities require for the proper execution of affidavits pursuant to the laws of his state have been complied with and further agrees, on behalf of himself, his firm, association, or corporation, that in any subsequent prosecution for perjury of himself, his firm, association, or corporation, it shall not be a defense to such charge of perjury that said formalities were not in fact complied with.

SWORN before me
this _____ day of _____, 2011

Notary Public

My Commission Expires:

(Notary Seal)

END OF SECTION 00 2113

**SECTION 01 1000
SUMMARY**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY OF WORK

- A. Project Description:
 - 1. Project Name: Walker County Schools Hvac Modifications, Fairyland Elementary School &, Cherokee Ridge Elementary
 - 2. Project Location: Lafayette, Walker County, Georgia
 - 3. Owner: Walker County Board of Education
 - 4. Drawing and Project Manual Date: March 1, 2017
 - 5. Architect: James W. Buckley & Associates, Inc, Albany, Georgia
- B. Contract Documents: Indicate work of Contract and related requirements and conditions that have impact on Project; related requirements and conditions indicated on Contract Documents include, but are not necessarily limited to the following:
 - 1. Existing site conditions and restrictions on use of site.
 - 2. Work performed prior to work under this Contract.
 - 3. Alterations and coordination with existing work.
 - 4. Work performed concurrently by Owner.
 - 5. Work performed concurrently by separate contractors.
 - 6. Work to be performed subsequent to work under this Contract.
 - 7. Owner Furnished materials for use and incorporation into project.
 - 8. Alternates.
 - 9. Requirements for partial Owner occupancy prior to Final Acceptance of Contract Work.
- C. Summary by References: Work of Contract summarized by references to Contract, General Conditions, Supplementary Conditions, Specification Sections, Drawings, addenda and modifications to Contract Documents issued subsequent to initial printing of Project Manual and including but not necessarily limited to printed material referenced by any of these.
 - 1. It is recognized that work of Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions and other forces outside Contract Documents.

1.03 SCHEDULE OF WORK

- A. Maintain work in such manner and method to complete Project on or before specified date.
- B. Contractor prepare and submit construction progress schedule indicating starting and completion dates of all major divisions and key sub-divisions of work.
 - 1. Schedule shall be organized so that the completion date for various aspects of the project occurs on or before dates indicated on the Proposal Form (Section B).
 - 2. Progress schedule shall be submitted prior to the first request for payment. Payment will not be issued until and acceptable schedule is received and approved by the Architect.
- C. The project shall be considered substantially complete only when each of the following conditions have been met.
 - 1. A final inspection has been requested by the contractor and performed by the Architect and a letter of substantial completion issued.
 - 2. A final inspection has been requested by the contractor and performed by the state Local Building Inspector and State Fire Marshall's office and an Occupancy Permit Issued.

1.04 COORDINATION

- A. Work of Contract includes coordination of entire work of project, including preparation of general coordination drawings, diagrams and schedules, and control of site utilization, from beginning of construction activity through project close-out and warranty periods.
- B. Responsibility of all parties providing material and/or labor (work) to this Contract to coordinate their work with other surrounding work to avoid conflicts in routing paths and improper installation that will not work with adjoining and surrounding constructed or to-be-constructed conditions; Correct such conflicts at the Contractor's expense.
- C. Construction Observations: The contractor responsible for coordinating required visits to allow for the observation of in place construction in accordance with the requirements contained herein, in technical specifications sections, by local, state and federal agencies:
 - 1. Unless otherwise noted or required by agencies having jurisdiction the Architect (or engineer), Testing Laboratory and Local Authorities shall be allowed to observe work prior to concealing of such work.
 - 2. Prior to the covering of any concealed or underground utilities or building components the contractor shall advise the appropriate parties of the date on which the work will be ready for viewing. The contractor's request for observation shall be issued a minimum of 72 hours prior to the date on which the observation is requested.
 - 3. No work shall be covered until the local authorities and architect have viewed the work and determined that the work in place complies with the provisions of the contract.

1.05 SEPARATE CONTRACTS

- A. Separate contracts will be let by Owner during construction of this project; refer to Article E-35 of General Conditions.
- B. Contractor coordinate and work closely with separate contracts in receiving, storage and protecting materials provided by separate contracts.
- C. Responsibility for their own insurance and security lies with the separate contracts.

1.06 CONTRACTOR'S DUTIES

- A. Except as specifically noted the contractor shall provide and pay for:
 - 1. Labor, material and equipment required or necessary.
 - 2. Tools, Construction equipment and machinery.
 - 3. Temporary Utilities, Including water.
 - 4. Other Facilities and Services necessary for proper execution and completion of work.
- B. Contractor to pay:
 - 1. Applicable sales, consumer and use taxes.
 - 2. Other applicable taxes.
- C. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at time of receipt of bids:
 - 1. Required Permits.
 - 2. Government Fees.
 - 3. License Fees.
 - 4. Inspection fees.
- D. Give Required Notices.
- E. Comply with codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities which apply.

- F. Promptly submit written notice to Architect of observed variance of Contract Documents from Legal Requirements.
- G. Enforce strict discipline and good order among employees. Do not employ on this project:
 - 1. Unfit Persons.
 - 2. Persons not skilled in assigned tasks.

1.07 GRADES AND LINES

- A. The Owner's Surveyor shall be responsible for the following:
 - 1. Furnish Bench mark(s).
- B. The Contractor Shall be responsible for the following:
 - 1. Providing survey base line.
 - 2. Required layout and staking of buildings, walks, drives, roads, parking areas and other site improvements.
 - 3. Layout and staking to be performed under the direct supervision of a Georgia Licensed land Surveyor.

1.08 UNSUITABLE SOILS

- A. For the purposes of this contract, the term 'unsuitable soils' shall be defined as being **existing** undisturbed soils which are determined by the testing laboratory to be unsuitable for use as structural fill for reasons other than moisture or water content.
 - 1. Water saturated soils, regardless of the source of the water (rainfall, storm run off, ground water or other sources) shall not be considered as unsuitable.
 - 2. Contractor responsible for dewatering or drying out of water saturated soils to the extent necessary to satisfy the requirements for structural fill.
 - 3. The contractor is solely responsible for the scheduling and sequencing of the work. If necessary to maintain the contractor's schedule, wet soils shall be removed and replaced with suitable structural fill or stone fill to replace water saturated soils. The removal and replacement of water saturated soils shall be performed at the contractor's expense.
- B. Fill Material: Fill material placed on site from contractor, regardless of whether fill is on-site or off-site borrow, cannot, by its nature, be classified as unsuitable soils.
 - 1. Materials placed as structural fill shall not be classified as unsuitable soils regardless of conditions encountered since only structural, suitable soils are to be used for fill.
 - 2. Structural fill shall be placed, compacted and tested as required by other sections of the specifications.
 - 3. The contractor shall be responsible for maintaining compacted structural fill in condition and at compaction levels required until improvement (site and/or building) is placed on fill.
 - 4. Should compacted soil be disturbed or become water saturated the contractor shall be responsible for conducting whatever work is necessary to restore to the soils to the specified criteria at no cost to the Owner.
- C. Water Saturated Soils: Should soils become saturated the contractor shall, as part of the scope of this contract, perform activities necessary to mediate and/or replace water saturated soils as required to obtain suitable structural fill as required by the testing laboratory.

1.09 CONTRACTOR USE OF PREMISES

- A. General: Contractor limit use of premises to work indicated, so as to allow for Owner occupancy and use by public.
- B. Use of the Site:
 - 1. Confine operations at site to areas permitted under Contract.
 - 2. Portions of site beyond areas on which work indicated not to be disturbed.
 - 3. Conform to site rules and regulations affecting work while engaged in project construction.
 - 4. Carefully place and watch work tools, ladders, hot tar kettles, and other similar equipment to prevent injury to students and teachers from these items.

5. Keep existing driveways and entrances serving premises clear and available to Owner and employees at all times; do not use these areas for parking or storage of materials.
 - a. Minimize disturbance to vehicular traffic.
 - b. Provide adequate means of access to all private and public properties during all stages of construction.
 6. Do not unreasonably encumber site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated; if additional storage necessary, obtain and pay for storage off site.
 - a. Assume full responsibility for protection and safekeeping of products stored on and off site.
 - b. Move any materials which interfere with operations of separate contracts or operations of owner.
 7. Lock automotive type vehicles, such as passenger cars and trucks and other mechanized or motorized construction equipment, when parked and unattended, so as to prevent unauthorized use; do not leave vehicles or equipment unattended with motor running or ignition key in place.
- C. Contractor's Use of the Existing Building:
1. Should work be underway at times when building is occupied, the Contractor shall limit use of premises, so as to allow for Owner occupancy and use by public.
 2. The Contractor shall, when deemed necessary, adjust work schedule as necessary to avoid conflicts with operation of facility.
 - a. The Principal (or Administrator if no principal exists) shall be the party responsible for determining what activities and operations conflict with the School's operation.
 - b. If requested by Principal all work performed, when not within construction period, shall be performed prior to 7:30 A.M., After 3:30 P.M. or on Holidays and weekends.
 3. Maintain existing building in safe and weathertight condition throughout construction period.
 - a. Repair damage caused by construction operations.
 - b. Take all precautions necessary to protect building and occupants during construction period.
 4. Keep public areas such as hallways, stairs, elevator lobbies and toilet rooms free from accumulation of waste material, rubbish or construction debris.
 5. Smoking or open fires not permitted within building enclosure or on premises.
- D. Security of New and Existing Building(s):
1. The contractor is advised that the building(s) has an operating security system. Coordinate with owner for access to building.
 2. The contractor shall be responsible for the security of the building for the duration of the construction project.
 3. Contractor responsible to make secure all building areas affected by work under this Contract at end of each day.
 - a. Insure that all doors, windows and other openings locked with their own existing locking device.
 - b. If locking devices do not exist, Contractor provide locking device.
 4. The contractor shall verify that the building is secure at the end of each day.
 5. All openings in the building envelope shall be sealed at the end of each day or when required by weather conditions. Seal shall prevent unauthorized passage, protect interior of building from construction material, and protect building components from water damage.
 6. The contractor is responsible for equipment and material losses or damages resulting due to inadequate implementation of security and weathertight security systems.
- E. Solid Construction Barriers: Where required or where indicated construct solid temporary construction barriers to separate work area from occupied portions of building.
1. Provide interior solid construction barriers between existing and new construction to prevent construction noise, debris, dust, etc. from disrupting school operations.
 2. Barriers to be constructed of 6 mil polyethylene (taped) over 3/4" plywood on 2 x 4 studs at 24" on center.
 3. Where required by Fire Marshal, barriers shall be constructed to allow exiting from existing building as required for emergencies only.
- F. Employee Behavior:
1. Contractor advised to warn all workmen that because of presence of students, loose and vulgar language not permitted.
 2. Partial Disrobing prohibited; workmen shall be required to wear shirts while on school property.
 3. Smoking, consuming of alcohol, or possession of controlled substances on school property prohibited.

1.10 OWNER OCCUPANCY

- A. Full Owner Occupancy: Owner will occupy site and existing building during period, other than summer months, of construction.
 - 1. Cooperate fully with Owner or his representative during construction operations to minimize conflicts and to facilitate Owner usage.
 - 2. Perform Work so not to interfere with Owner's operation.
- B. Partial Owner Occupancy: Owner reserves right to place and install equipment as necessary in completed areas of building and occupy such completed areas prior to Final Acceptance, provided that such occupancy does not substantially interfere with completion of Work.
 - 1. Such placing of equipment and partial occupancy does not constitute acceptance of Work or any part of Work.

1.11 OWNER'S RIGHT TO OCCUPY INCOMPLETE WORK

- A. Should the Project, or any portion thereof, be incomplete for Substantial Completion or final completion at the scheduled date or dates, the Owner shall have the right to occupy, and/or complete any portion of the Project. In such an event, the Contractor shall not be entitled to any extra compensation on account of said occupancy by the Owner's normal full use of the project, nor shall the Contractor interfere in any way with said normal full use of the project. Further, the contractor shall not be relieved of any responsibilities of the Contractor, including the required times of completion. Such occupancy by the Owner does not, in itself, constitute Substantial Completion nor Final Completion.

1.12 EXISTING CONDITIONS

- A. Existing conditions shown in Contract Documents are, to best of Architect's knowledge, accurate.
 - 1. Under requirements of Contract Documents, Bidder visit jobsite prior to bid date, verify and review existing conditions, and insure that he has accounted for, in his bid, all costs to accomplish Work.
 - 2. If actual field conditions and/or dimensions found different than indicated by Contract Documents, Bidders, prior to bid date, promptly report to Architect all discrepancies and request clarification in accordance with General Conditions.
- B. Prior to bid, any on-site inspection of facility, contractors make call or visit facility administrator and identify himself and purpose of visit.
 - 1. Permission to inspect the facility granted only by administrator before any on-site activity accomplished.
 - 2. Contractors check conditions affecting work and notify Architect of any discrepancies between drawings and existing conditions that may affect work adversely, including list of structural defects or existing damages to building.
- C. Contractor take photographs (35 mm) throughout interior and exterior of buildings to document existing conditions prior to starting of construction; keep photographs on file at jobsite.
 - 1. This requirement included to protect Contractor's interest, and filing of such list will preclude possibility of damages being assigned Contractor for repairs.
 - 2. Contractor does not have responsibility of repairing any damages not result of his own negligence.
- D. When Contractor moves on site and starts construction, it is be construed as his complete acceptance of existing site conditions.

1.13 DIMENSIONS

- A. Contractor verify dimensions shown on Contract Documents relative to interfacing new work to existing on jobsite.
 - 1. Dimension and construct work to fit, blend, and conform to actual constructed conditions.
- B. Field verify dimensions, sizes and locations of items that depend on actual constructed conditions (new and existing), prior to fabrication or erection of each item.

- C. Dimensions indicated on drawings relative to existing construction are approximate and shall be field verified by the contractor prior to bidding. No changes to the contract amount will be made due to contractor's failure to verify dimensions.

1.14 HAZARDOUS MATERIALS

- A. Hazardous Materials: It shall be a requirement that neither the Contractor, nor his material suppliers, nor his Subcontractors install or otherwise incorporate any materials containing asbestos, PCB or other hazardous materials within the boundaries of the Project.
 - 1. No soil found on site, or transported to the site from remote locations which is contaminated with material containing asbestos, PCB, Radon, gasoline, fuel oil, diesel fuel or other similar fossil fuels shall be used for fill, backfill or landscape topsoil.
 - 2. The Contractor shall require that each of his Subcontractors and material suppliers warrants to Owner and Architect that all materials, products and assemblies incorporated, or submitted for incorporation into this Project, are totally free of asbestos, PCB, or other such hazardous materials.
 - 3. If the Contractor or his Subcontractors or material suppliers have knowledge that, or believe that an item, component, material or accessory within a product or assembly may contain asbestos, PCB or other such hazardous material, it is the Contractor's sole responsibility to secure a written certification from the manufacturer of any suspected material stating this material is totally free of asbestos, PCB or other hazardous materials. A copy of the written certification shall be submitted to the Owner and Architect.
- B. Asbestos: All materials provided and installed by contractor shall be 100% free of asbestos containing materials.
 - 1. The manufacturer of each construction material shall certify that products utilized in construction of this facility are 100% free from asbestos.
 - a. Individual product certifications required.
 - b. General product certifications not acceptable. Certification must address project by name.
 - 2. The general contractor shall certify that all materials utilized in the construction of this facility are 100% free from asbestos.
- C. Lead: No lead materials shall be utilized in the domestic water system components and plumbing fixtures.
 - 1. No lead shall be utilized in paint.
 - 2. The plumbing contractor shall certify that no lead was utilized in the plumbing system.
 - 3. The paint manufacturer shall certify that no lead was contained in paint utilized.
 - 4. The manufacturer of the plumbing fixtures shall certify that no lead was utilized in any plumbing fixture.
- D. Post Construction Testing: The Owner, after completion of the project, may elect to have in place materials tested for asbestos, lead and/or PCBs. The cost for the testing shall be paid for by the Owner.
 - 1. If hazardous materials are found the contractor shall pay for the cost of the testing as well as the cost for removal of material and replacement with non-hazardous materials.

1.15 COLORS

- A. Unless otherwise specified in other sections, colors selected after contract awarded, and during shop drawing submittal stage.
 - 1. Colors selected from samples submitted by Contractor, therefore not longer than thirty (30) days after date of "Notice to Proceed", submit to Architect, appropriate color samples of all materials requiring color selections.
 - 2. Submit **ONLY** those colors from which selections are to be made.
 - 3. Color selections will be made after all required color samples have been submitted. NO partial color selections will be made.
- B. Color Selection Process: Upon receipt of the required color samples the architect will develop the necessary color schedules and boards for presentation to the Owner for review and approval.
 - 1. The contractor, in the development of the project schedule, and in the submission of the color samples, shall assume that the color selection process will take **Ninety (90) days** once all of the required samples have been received.

1.16 MISCELLANEOUS PROVISIONS

- A. Mechanical/Electrical Requirements of General Work:
 - 1. Except as otherwise indicated, comply with applicable requirements of Division-22 Sections for plumbing provisions within units of general (Division 2-33) Work.
 - 2. Except as otherwise indicated, comply with applicable requirements of Division-23 Sections for mechanical provisions within units of general (Division 2-33) Work.
 - 3. Except as otherwise indicated, comply with applicable requirements of Division-26, 27 and 28 sections for electrical provisions within units of general (Division 2-33) Work.

- B. Service Connections:
 - 1. Refer to Divisions-22, 23 and Divisions-26, 27, and 28 sections for characteristics of mechanical and electrical services connected to units of general work.
 - 2. Provide units manufactured or fabricated for proper connection to and utilization of available services, as indicated.
 - 3. Except as otherwise indicated, final connection of mechanical services to general work defined as mechanical work, and final connection of electrical services to general work is defined as electrical work.
 - 4. Unless specifically noted (in writing) elsewhere in contract documents or approved in writing by the architect all plumbing, mechanical and electrical rough-ins, services, connections, raceways, pathways, conduits, and sleeves shall be fully concealed.

- C. Electrical Requirements:
 - 1. Except as otherwise indicated, comply with applicable provisions of National Electrical Code (NEC) and standards by National Electrical Manufacturer's Association (NEMA), for electrical components of general work.
 - 2. Provide Underwriters Laboratories listed and labeled products where applicable.

PART 2 - PRODUCTS (Not applicable).

PART 3 - EXECUTION

3.01 REMOVAL OF EXISTING CONSTRUCTION

- A. Where required for installation of new materials, the contractor shall remove existing construction.
 - 1. Existing materials shall be repaired and refinished in accordance with provisions stated below.

- B. Where new finishes are specified to be installed, the contractor shall, unless noted otherwise, remove the existing finish completely.
 - 1. Where new floor covering is specified to be installed the contractor shall remove the existing flooring and adhesive or setting bed completely.
 - 2. Where new base is specified to be installed the contractor shall remove existing base and adhesive completely.
 - 3. Where new ceiling is specified to be installed the contractor shall remove the existing ceiling tile(s), grid(s) and suspension system(s) completely.

- C. Where tile (asphalt, vinyl or vinyl asbestos) is scheduled to be removed, remove tile and adhesive as asbestos containing material. Refer to other sections of these specifications for requirements.

3.02 DEMOLITION AND PATCHING

- A. Perform all demolition and patching required to accomplish the work called for under this contract.

- B. All material shown to be removed, unless noted otherwise, shall become the property of the contractor and shall be removed from the site and disposed of in a legal manner.

- C. Repair and patch all damaged materials (finishes, systems, etc.) resulting from work performed under this contract. The "patched" work shall match the existing material, finish, and color of adjacent surrounding materials.

3.03 MINOR ADJUSTMENTS

- A. Minor adjustments permitted in measurements shown on drawings that cover new work, so that all revised and new work properly fit, join, unite and connect onto present work, all in acceptable and satisfactory manner.
 - 1. If minor adjustments in the measurements required, do not change design, general arrangements, nor fabrication of Work.

3.04 STRUCTURAL MEMBERS

- A. Do not cut structural members and framing under any circumstances except where expressly and particularly indicated on drawings and within specifications.
 - 1. If cutting, demolition, etc., required for Work creates change in conditions differing from those indicated on drawings and in specifications, which cause serious weakening or possible damage to any part of present structure, request instructions for continuing Work.

3.05 OVERLOADING STRUCTURES

- A. Do not overload roofs; Contractor repair damage to buildings or interior of buildings, caused by overloading, to satisfaction of Architect and Owner.
- B. Repair any damages to building or interior of buildings, caused by overloading, to the satisfaction of the Architect and Owner.

3.06 CLEAN UP

- A. Waste Materials: Contractor maintain construction premises and jobsite in reasonably neat and orderly condition and free from accumulations of waste material and rubbish during construction period.
 - 1. Remove all crates, and other flammable waste material or trash from work areas at end of each working day.
- B. Contractor remove all rubbish, crates, flammable waste material, trash and debris promptly from buildings and premises at end of each working day; do not permit rubbish and debris to accumulate in excessive amounts that will become hazardous.
 - 1. Comprehensive project cleanup to be performed, as an absolute minimum, once a month.
- C. Finishing: Clean all areas of building throughout just prior to the start of painting and finishing; maintain these areas in satisfactory condition during painting and finishing, then clean and restore any finished surfaces defaced in any way by mechanics and workmen and restore to their original condition.
 - 1. Clean and restore new and existing finished surfaces defaced in any way by mechanics and workmen, as result of work under this Contract, in their original condition.
- D. Final: Upon completion of the work, Contractor remove all temporary construction facilities, including buildings, fences, scaffolding, unused materials provided for the work and rubbish of any kind, leaving building, site, and/or adjacent property in neat and clean condition acceptable to Architect and Owner.

3.07 REPAIRING AND REFINISHING

- A. Damaged Materials: Repair or replaced all construction, materials, equipment and furnishings damaged as a result of work performed under this contract.
 - 1. Where damage is to equipment and or furniture, and repair of items to pre-construction condition is not possible or feasible, the contractor shall replace with new equipment or furniture of like quality at no cost to the Owner.
 - 2. Where damage is to new or existing construction the contractor shall, if possible, patch work to pre-damage conditions. If an patch is not of acceptable quality, damaged material or finish shall be replaced with new.

- B. Patch all damaged areas resulting from work under this Contract.
 - C. Refinish patched work, to satisfaction of the Architect, to produce surfaces which match existing finish or adjoining surfaces or adjacent similar surfaces or refinished adjoining or adjacent surfaces; if suitable match cannot be obtained refinish (paint) entire surface.
 - 1. Where existing or new surfaces are to be painted due to repair or refinishing activities, extend painting to nearest perpendicular intersection, both directions.
 - D. Where existing concrete or asphalt paving is defaced, damaged or destroyed due to work performed under this contract, the contractor shall repair or replace existing using materials, methods and finishing techniques to match existing.
- 3.08 TRASH BURNING / BURYING
- A. On Site Burning:
 - 1. On site burning of materials not permitted.
 - B. On Site Burying of Materials:
 - 1. Burying of material on site not permitted.
- 3.09 SHRUBBERY
- A. Protect existing shrubbery from damage.
 - 1. Keep ditches far enough from shrubbery to not damage or interfere with roots.
 - 2. Contractor replace damaged shrubbery at no expense to Owner.
- 3.10 EXISTING UTILITIES
- A. The contractor is advised that a substantial number of underground utilities exist in the construction area.
 - B. Contractors shall check with local utility companies and Owner for locations of underground utilities and piping.
 - 1. Flag all identified utilities.
 - 2. Contractor repair lines ruptured due to the performance of work associated with this contract at no expense to Owner.
- 3.11 INTERRUPTION OF UTILITIES:
- A. Utility services (electricity, water, sewer, Gas and storm) shall not be interrupted while the existing facilities area in use.
 - B. Transfer of utility services shall occur after school hours, on weekends or scheduled holidays.
 - C. Under No circumstances shall utility services to existing buildings be interrupted when the facility is in use.
 - D. The contractor shall provide 72 hours written notice to the architect prior to interruption of electrical services.
- 3.12 MECHANICAL SYSTEMS:
- A. Equipment not shown to be replaced with new shall be reused. Protect for duration of project and render operational upon completion of work.
 - B. Contractor shall remove all abandoned mechanical systems.

- C. Abandoned Equipment: Unless noted otherwise, remove the following where systems are to be replaced with new:
 - 1. Existing central HVAC system components, boiler, chiller, fans, motors, ductwork, grilles, etc..
 - 2. Existing window type HVAC units, where new units are shown to be installed.
 - 3. Roof top exhaust fans and associated ductwork.
 - 4. Roof top HVAC Units, Ductwork, support frames and associated materials.
 - 5. Miscellaneous equipment including:
 - a. HVAC Support frames.
 - b. Pitch Pockets.

3.13 ELECTRICAL SYSTEM:

- A. Equipment not shown to be replaced with new shall be reused. Protect for duration of project and render operational upon completion of work.
- B. Unless shown to be replaced with new or indicated to be removed, all electrical devices which were operational (functional) prior to commencement of renovation shall be operational upon completion.
- C. Unless noted otherwise all abandoned electrical conduit, cable, electrical wiring, communications wiring devices shall be removed from project site and disposed of by contractor.
- D. The new electrical conduit shown on the electrical drawings is in schematic form only. All conduit shall be run on solid backing as directed by architect.
 - 1. The routing of electrical conduit may vary from methods shown on electrical drawings in order to obtain proper routing paths. Such rerouting shall be at no added cost to the contract.
- E. All new conduit shall be run concealed where installed at location of new construction. Exposed conduit not permissible except at existing building construction where not possible to conceal.
 - 1. Where conduit is run exposed the conduit shall be painted in accordance with provisions of Section 09900.
 - 2. Where existing or new walls contain a cavity or cell larger than 2" the contractor shall "fish" flex down in cavity of wall to maintain a fully concealed application.
- F. Unless noted otherwise all abandoned electrical conduit, cable, electrical wiring, communications wiring devices shall be removed from project site and disposed of by contractor.

3.14 CERTIFICATION OF LINES AND LEVELS

- A. Contractor shall check all grades, lines, levels and dimensions as shown on the drawings and shall promptly report to the architect in writing any discrepancies for clarification before commencing work.

END OF SECTION 01 1000

SECTION 01 2600
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to this Section.
- B. Section E; Article E-15; Changes in the Work apply.

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections: Following sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Product Substitutions" for administrative procedures for handling requests for substitutions made after award of Contract.

1.03 MINOR CHANGES IN THE WORK

- A. Supplemental instructions authorizing minor changes in Work, not involving adjustment to Contract Sum or Contract Time, issued by Architect by appropriate written form.

1.04 CHANGE ORDER PROPOSAL REQUESTS

- A. Change Orders: Changes in the scope of the project which affect either Contract amount or time shall be incorporated into the contract through the issuance of a change order signed by the Owner and the contractor.
 - 1. No change to the contract amount or time shall be made without the execution of a change order.
- B. Owner-Initiated Proposal Requests: Proposed changes in Work that require adjustment to Contract Sum or Contract Time issued by Architect, with detailed description of proposed change and supplemental or revised Drawings and Specifications, if necessary.
 - 1. Proposal requests issued by Architect are for information only.
 - 2. Do not consider them instruction either to stop work in progress, or to execute proposed change.
 - 3. Unless otherwise indicated in the proposal request, within 7 days of receipt of proposal request, submit to Architect for Owner's review, estimate of cost necessary to execute proposed change.
 - 4. Include list of quantities of products to be purchased and unit costs, along with total amount of purchases to be made.
 - 5. Indicate applicable time and rates for labor.
 - 6. Where requested, furnish survey data to substantiate quantities.
 - 7. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 8. Indicate applicable overhead and profit as percentages and dollars.
 - 9. Include statement indicating effect proposed change in Work will have on Contract Time.
- C. Contractor-Initiated Change Order Proposal Requests: When latent or other unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting request for change to Architect.
 - 1. Include statement outlining reasons for change and effect of change on Work.
 - 2. Provide complete description of proposed change.
 - 3. Indicate effect of proposed change on Contract Sum and Contract Time.
 - 4. Include list of quantities of products to be purchased and unit costs along with total amount of purchases to be made.
 - 5. Indicate applicable time and rates for labor.
 - 6. Where requested, furnish survey data to substantiate quantities.
 - 7. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

8. Indicate applicable overhead and profit as percentages and dollars.
 9. Comply with requirements in Section "Product Substitutions" if proposed change in Work requires substitution of one product or system for product or system specified.
- D. Allowable Costs: The contractor shall refer to Article E-15 of the Section E of the General Conditions to the specifications for a detailed description of allowable expenses as it relates to the development of change orders. Allowable costs shall only include those costs, including equipment costs, directly associated with proposed change.
- E. Overhead and Profit: The contractor shall refer to Section D, Supplementary General Conditions and Article E-15 of Section E of the General Conditions of the Specifications for allowable percentages for overhead and profit. Percentages utilized in the development of change orders shall not exceed those listed.
- F. Delays: The contractor understands that due to the nature of construction projects certain changes to the contract documents, during the construction are likely to occur and that such changes to the contract documents, whether initiated by the Architect, Owner or Contractor shall not be grounds for claims for delays or additional costs associated with the issuance of such changes.
1. Extensions in time authorized only when the change order material changes the scope of the work or where, due to timing of the change order, the work cannot be performed in anticipated sequence as shown on the contractor's initial project schedule.
- G. Proposal Request Form: Form of proposal to be as agreed upon between Architect and Contractor. Degree of detail required on form to be similar to the contractor's Detailed Cost Breakdown"
- H. Change Order Review: The contractor shall submit requests for change orders, with all required back-up information in form indicated, allowing sufficient time for Architect, Engineers, and Owner to review proposal for accuracy and acceptability.
1. Change order requests which do not have sufficient breakdown, back-up or supporting data, or which are found to have costs exceeding those contained in the contractor's initial detailed breakdown will be rejected and returned to the contractor for correction.
 2. Allow 21 calendar days for the Architect, Engineer and owner to review each proposal
 3. Allow and additional 21 days for the Architect, Engineer and Owner to review each revised proposals.
- 1.05 CHANGE ORDER PROCEDURES
- A. Upon receipt of request for proposals the contractor shall develop and submit to the architect a detailed cost breakdown of costs associated with the change order.
- 1.06 FORM OF SUBMISSION:
- A. The change order shall be submitted in accordance with the requirements of this section and the following:
1. Each change order proposal shall be submitted and numbered separately. Change order proposal #1 shall be labeled as COP #1. Each subsequent proposal shall be numbered consecutively.
 2. The contractor shall provide a completed detailed narrative of scope of work included in change order proposal.
 3. Attach a copy of the architect's request for proposal, RFI (request for information) and other documentation necessary to clarify the scope of the proposal.
 4. Attach a copy of each supplemental drawing and/or sketch on which the proposal is based.
- B. Effect on Time: Extensions in time authorized only when the change order material changes the scope of the work or where, due to timing of the change order, the work cannot be performed in anticipated sequence as shown on the contractor's initial project schedule.
1. As part of change order proposal the contractor shall provide a statement of effect change order has on time.
 2. Contractor shall, where allowed by the contract documents, request, as part of the change order proposal and extension in time. The requests shall clearly indicate the number of calendar days extension of time required.

1.07 REVIEW OF SUBMISSION:

- A. The architect will review the change order proposal for completeness, compliance with contract provisions and fairness of pricing.
 - 1. Incomplete or non compliant change order proposal will be returned to the contractor for revision and re-submission.
 - 2. The rejection of the change order proposal for failure to provide requested information or failure to comply with contract provisions shall not be grounds for claims for delays.

1.08 ISSUANCE OF CHANGE ORDER

- A. Upon Owner's approval of Change Order Proposal Request (Proposal), Architect will issue Change Order for signatures of Owner and Contractor, as provided in the Conditions of the Contract.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 2600

**SECTION 01 4000
QUALITY REFERENCES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF REQUIREMENTS

- A. General:
 - 1. Required inspection and testing services intended to assist in determination of probable compliance of work with requirements specified or indicated.
 - 2. These required services do not relieve Contractor of responsibility for compliance with these requirements or for compliance with requirements of Contract Documents.
- B. Definitions:
 - 1. Requirements of this section relate primarily to customized fabrication and installation procedures, not to production of standard products.
 - 2. Quality control services include inspections and tests and related actions including reports, performed by independent agencies and governing authorities, as well as directly by Contractor.
 - 3. These services do not include Contract enforcement activities performed directly by Architect or Engineer.
 - 4. Specific quality control requirements for individual units of work specified in section of these specifications that specify individual element of Work.
 - 5. These requirements, including inspections and tests, cover both production of standard products, and fabrication of customized work.
 - 6. These requirements also cover quality control of installation procedures.
- C. Inspections, tests and related actions specified in this section and elsewhere in Contract Documents not intended to limit Contractor's own quality control procedures which facilitate overall compliance with requirements of Contract Documents.
- D. Requirements for Contractor to provide quality control services required by Architect/Engineer, Owner, governing authorities or other authorized entities not limited by provisions of this Section.

1.03 RESPONSIBILITIES

- A. Contractor Responsibilities: Except where specifically indicated as being Owner's responsibility, or where provided by another identified entity, inspections, tests and similar quality control services and measures are the **Contractor's** responsibility.
 - 1. Include costs for these services in Contract Sum.
 - 2. These services also include those specified as performed by independent agency and not directly by Contractor.
 - 3. Contractor shall employ and pay independent agency, testing laboratory or other qualified firm to perform quality control services specified.
- B. Retest Responsibility: Where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance of related work with requirements of Contract Documents, then retests are responsibility of Contractor, regardless of whether original test was Contractor's responsibility.
 - 1. Retest work revised or replaced by Contractor is Contractor's responsibility, where required tests performed on original work.

- C. Costs Associated with After-Hours or Overtime Testing: Where indicated that owner will provide certain testing required by applicable codes to verify compliance. The Owner's obligation for these testing services is limited to payment for test performed at standard rates.
1. Should the contractor request or require that tests be taken at times when rates higher than normal apply (overtime, weekend, holidays), the contractor shall be responsible for the additional costs.
- D. Contractor's Convenience Testing: Inspections, tests and related actions specified in this section and elsewhere in Contract Documents not intended to limit Contractor's own quality control procedures which facilitate overall compliance with requirements of Contract Documents.
1. Inspections or testing performed exclusively for the Contractor's convenience and quality control shall be the sole responsibility of the contractor.
 2. The Contractor shall be responsible for costs associated with convenience testing.
- E. Code Compliance Testing: Inspections and tests required by codes or ordinances, or by plan approval authority, and made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Owner
- F. Responsibility for Associated Services: Contractor required to cooperate with independent agencies performing required inspections, tests and similar services regardless of whether the testing is indicted to be the contractor's or the owner's responsibility.
1. Provide such auxiliary services reasonably requested.
 2. Notify testing agency sufficiently in advance of operations to permit assignment of personnel.
 3. These auxiliary services include but not necessarily limited to following:
 - a. Providing access to the work.
 - b. Taking samples or assistance with taking samples.
 - c. Delivery of samples to test laboratories.
 - d. Security and protection of samples and test equipment at project site.
- G. Coordination: Contractor and each independent agency engaged to perform inspections, tests and similar services for Project coordinate sequence of their activities to accommodate required services with min. of delay in progress of Work.
1. In addition, Contractor and each independent testing agency coordinate their work to avoid necessity of removing and replacing work to accommodate inspections and tests.
 2. Contractor responsible for scheduling times for inspections, tests, taking of samples and similar activities.
 - a. By advanced discussion with the Testing Laboratory, determine the time required for laboratory to perform its tests and to issue reports of findings.
 - 1) Provide all required time within construction schedule.
 - b. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with Testing Laboratory.
 - c. When Testing Laboratory is ready to test according to determined schedule, but is prevented from testing or taking specimens due to incompleteness of the work, all extra costs for testing attributable to the delay shall be charged to and paid by the contractor.
- H. Owner's Responsibilities:
1. **Owner** to engage and pay for services of independent agency to perform inspections and tests only where specifically specified as Owner's responsibilities.
 2. The Owner shall employ and pay for services of and independent testing agency, testing laboratory or other qualified firm to perform ONLY those services which are classified herein as Owner's Responsibilities.
 3. For the purposes of this section the testing associated with the following shall be considered as the Owner's Responsibilities:
 - a. Earthwork, Densification, and Compaction
 - b. Concrete Sampling and Testing; Excluding Slump Tests and Design Mix Testing.
 - c. Masonry Mortar Testing (At the Owner's Option)
 - d. Grout Testing (At the Owner's Option).
 - e. Welding Testing
 - f. Carpet Testing (At the Owner's Option).

- I. Owner's Convenience Testing: Nothing contained within this specification shall be construed as limiting the owners right to test building systems to verify conformance with contract provisions. Where no testing requirements are defined in referenced technical specifications, the Architect and / or owner may at their option, elect to have testing performed.
 - 1. Optional testing under this paragraph to be paid for by owner.

1.04 QUALITY ASSURANCE

- A. Qualification for Service Agencies: Except as otherwise indicated, engage inspection and test service agencies, including independent testing laboratories, prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by American Council of Independent Laboratories, and recognized in industry as specialized in types of inspections and tests performed.
 - 1. Inspecting and Testing Firm shall be selected by contractor and approved by Architect.
- B. Codes and Standards: Testing will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing Materials.

1.05 SUBMITTALS

- A. General:
 - 1. Refer to Division-1 section on "Submittals" for general requirements on submittals.
 - 2. If Contractor responsible for service, submit certified written report of each inspection, test or similar service through Contractor, in triplicate.
 - 3. Submit additional copies of each written report directly to governing authority, when authority so directs.
- B. Report Data: Written reports of each inspection, test or similar service shall include, but not limited to following:
 - 1. Name of testing agency or test laboratory.
 - 2. Dates and locations of samples and tests or inspections.
 - 3. Names of individuals making the inspection or test.
 - 4. Designation of the work and test method.
 - 5. Complete inspection or test data.
 - 6. Test results.
 - 7. Interpretations of test results.
 - 8. Notation of significant ambient conditions at time of sample-taking and testing.
 - 9. Comments or professional opinion as to whether inspected or tested work complies with requirements of Contract Documents.
 - 10. Recommendations on retesting, if applicable.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.01 TAKING SPECIMENS

- A. All specimens and samples for testing, unless otherwise specified in these contract documents, shall be taken by Testing Laboratory.
 - 1. Sampling equipment and personnel to be provided by testing laboratory.
 - 2. Deliveries of samples and specimens to testing laboratory to be by testing laboratory's personnel.

3.02 REPAIR AND PROTECTION

A. General:

1. Upon completion of inspection, testing, sample-taking and similar services performed on Work, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.
2. Comply with Contract Document requirements for "Cutting and Patching".
3. Protect work exposed by or for quality control service activities, and protect repaired work.
4. Repair and protection is Contractor's responsibility, regardless of assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01 4000

**SECTION 01 4100
REGULATORY REQUIREMENTS**

PART 1 - GENERAL

1.01 REGULATORY AGENCIES

- A. Contractor responsible for notifying following agencies as to date that construction activities scheduled to commence:
 - 1. Clerk of Superior Court in County in which project is to be constructed; "Notice of Commencement".
 - 2. City or County Building Inspectors
 - 3. EPA / EPD
 - 4. Department of Natural Resources
 - 5. Utility Companies
 - 6. E-Verify
- B. Contractor responsible for notifying following agencies as to date building is ready for preliminary and/or final inspection(s).
 - 1. Local Fire Marshal
 - 2. State Fire Marshal
 - 3. City or County Building Inspectors
- C. Inspection Reports:
 - 1. Contractor shall send two copies of required notifications transmitted to Architect.
 - 2. Contractor have all inspection reports sent directly to him with copies to Owner and Architect.
 - 3. In event of inspection by one of above listed agencies not required, Contractor notify Owner and Architect in writing which agency and why not required to inspect building.
- D. Forms:
 - 1. Form of "Notice of Commencement" included at end of this Section.
 - 2. Application for 80% preliminary and 100% final inspections by Fire Marshal included at end of this Section.
 - 3. Contractor Affidavit under O.C.G.A 13-10-91, E-Verify (b) (1) Contractor
 - 4. Contractor Affidavit under O.C.G.A 13-10-91, E-Verify (b) (3) Sub-Contractor
 - 5. Contractor Affidavit under O.C.G.A 13-10-91, E-Verify (b) (4) Sub-Sub-Contractor
 - 6. Contractor obtain necessary forms from agencies required by respective agency.
- E. Fees and Costs:
 - 1. Contractor pay all inspection fees required and performed by agencies having jurisdiction. Contractor responsible for fee payments until all contract related deficiencies corrected to satisfaction of inspecting agency. If non-contract related deficiencies exist, Contractor's responsibility not negated until all contract related deficiencies corrected.
 - 2. Contractor responsible for costs associated with initial inspection and follow-up inspections (reinspections), when required, until all documented deficient work corrected and Occupancy Permit issued by all authorities having jurisdiction.

1.02 PREREQUISITES TO FINAL INSPECTIONS BY AUTHORITIES

- A. General: Prior to requesting final inspections by the local and/or state authorities the contractor shall develop necessary documentation which adequately demonstrates that the building complies with applicable regulations and codes, permitted drawings and specifications and contract documents.
- B. Procedural: A minimum of sixty (60) days prior to the request for final inspection(s) the contractor shall develop and submit to the architect a minimum of four (4) each hardbound, three ring notebook type binders, tabbed, indexed and cross referenced adequately to ensure ease in locating necessary documentation.
 - 1. The architect shall review the note books for compliance with requirements described herein. The contractor shall be notified of revisions and or additions required to the documents.

2. The contractor shall have on site two complete and corrected copies of the note books at the time of the Fire Marshals final inspection. One copy of this note book shall be furnished to the fire marshal.
- C. The note books shall contain, as a minimum the documentation described below.
1. Notices:
 - a. Notice of Readiness for Final Inspection (General Conditions, Article E-41)
 2. Inspection Reports:
 - a. Copy of Previous Inspection Reports with written responses to each item.
 3. Construction Permit:
 - a. Copy of Fire Marshal Construction Permit
 - b. Copy of Construction Permits (If Any) issued by local authorities
 - c. Copy of Building Permit
 4. Drawings and Specifications:
 - a. Original State Fire Marshal Reviewed plans and specifications with attached review comments.
 5. Product Data: Provide product data which clearly states the product's fire rated and burning characteristics, including fire ratings, flame spread, smoke developed and other related data for each of the following:
 - a. Floor coverings including vinyl tile floor, carpet and related materials
 - b. Walls including gypsum board, concrete block with applicable UL Design numbers
 - c. Wall coverings including paint, vinyl wall covering, acoustical wall panels.
 - d. Doors, Doors frames and Windows
 - e. Ceilings
 6. Fire Rated Penetrations: The contractor shall develop and have each trade contractor develop and submit a detailed description of each of systems utilized for sealing penetrations through fire rated and smoke rated construction. Provide as a minimum:
 - a. Description of condition, location and smoke or fire rating for which system is being used.
 - b. UL number of system being used with back up documentation showing UL Design
 7. Site Utilities Work
 - a. NFPA form, Underground utilities certifications
 - b. Letter from site utilities contractor certifying that the work has been installed in strict compliance with requirements of the contract documents and all applicable codes..
 - c. Contractor's name, firm, address, telephone number.
 - d. Contractor's license number
 8. Building Contractor:
 - a. Copy of Fire Marshal approved bleacher (where applicable) shop drawings
 9. Plumbing System
 - a. NFPA form, Underground utilities certifications
 - b. Letter from plumbing contractor certifying that the work has been installed in strict compliance with requirements of the contract documents and all applicable codes.
 - c. Copy of Department of Labor approval of boilers, and where water heaters classified as boilers of water heaters.
 - d. Contractor's name, firm, address, telephone number.
 - e. Contractor's license number
 10. Sprinkler System
 - a. Letter from plumbing contractor certifying that the work has been installed in strict compliance with requirements of the contract documents and all applicable codes.
 - b. Copy of Fire Marshall approved building sprinkler system shop drawings
 - c. Contractor's name, firm, address, telephone number.
 - d. Contractor's license number
 - e. Installer's certificate of competency and photo identification of installer.
 11. Mechanical System
 - a. Letter from plumbing contractor certifying that the work has been installed in strict compliance with requirements of the contract documents and all applicable codes.
 - b. Kitchen exhaust hood shop drawings
 - c. Contractor's name, firm, address, telephone number.
 - d. Contractor's license number

12. Electrical System

- a. Letter from plumbing contractor certifying that the work has been installed in strict compliance with requirements of the contract documents and all applicable codes.
- b. Certification of installation and proper operation of Fire Alarm System.
- c. Copy of Fire Marshall approved Fire Alarm Shop Drawings
- d. Documentation and certification of start up and proper operation of emergency generator.
- e. Contractor's name, firm, address, telephone number.
- f. Contractor's license number, including low voltage contractor

PART 2 - PRODUCTS (Not applicable).

PART 3 - EXECUTION

3.01 NOTICE OF COMMENCEMENT

- A. Within 7 Calendar Days of Commencement of Construction activities; contractor shall transmit to Clerk of the Superior Court in county in which project is located, form of "Notice of Commencement".
 1. Submit copy of fully executed 'Notice of Commencement' to the Owner and Architect.

3.02 REQUEST FOR INSPECTION(S)

- A. In appropriate and timely manner and using applicable forms, notify authorities having jurisdiction that Project ready for required inspections.
 1. Written notification required, indicating:
 - a. Type inspection required.
 - b. Stage of Project construction.
 - c. Proposed date of inspection.
 - d. Other requirements of specific agency or authority.
 2. Transmit copy to Architect.

3.03 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor assist inspecting authority in performance of inspection.
 1. Accompany inspector until inspection complete.
 2. Provide equipment required for inspections, including but not limited to:
 - a. Flashlights.
 - b. Mirrors.
 - c. Ladders.
 - d. Measuring devices.
 - e. Other items required by specific inspection agency.

3.04 SUBCONTRACTS:

- A. The contractor or subcontractor shall insert in any subcontracts the clauses for providing Contractor Affidavit for E-Verify form and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in in above and O.C.G.A. 13-10-91. Each company has to go on line, register and take knowledge test. Once this is done, you will receive company ID #<https://e-verify.uscis.gov/emp>

3.05 INSPECTION - FIRE MARSHALL

- A. Eighty (80%) Inspection:
1. Notify Fire Marshall and request inspection upon completion of 80% of Project, providing minimum of 21 days notice.
 2. 80% completion defined as having structural components in place and open for review of fire safety components such as:
 - a. Fire walls.
 - b. Vertical shafts.
 - c. Stairways.
 - d. Smoke stops.
 - e. Hazardous area separation.
 - f. Roof and ceiling assemblies.
 - g. Corridor and door width.
 - h. HVAC system.
 3. Do not install ceilings or other obstructing elements until 80% inspection complete and acceptable.
 4. Upon receipt of Fire Marshall's report, Contractor take following actions:
 - a. Type Fire Marshall's hand written report.
 - b. Review and respond in writing to each item in report indicating status of item, proposed method of resolution, and time resolution to finished.
 - c. Transmit copies of report and response to Architect.
 - d. Correct deficiencies indicated on report.
- B. One Hundred (100%) Inspection:
1. Notify Fire Marshall and request inspection upon completion of 100% of Project, providing minimum 21 days notice.
 2. 100% completion defined building ready to occupy and qualify for Certificate of Occupancy.
 3. Perform 100% inspection prior to occupancy of Project.
 4. Upon receipt of Fire Marshall's report, Contractor take following actions:
 - a. Type Fire Marshall's hand written report.
 - b. Review and respond in writing to each item in report indicating status of item, proposed method of resolution, and time resolution to finished.
 - c. Transmit copies of report and response to Architect.
 - d. Correct deficiencies indicated on report.
- C. Reinspection(s):
1. When documented deficiencies corrected, notify Fire Marshall Project ready for reinspection.
 2. Upon receipt of Fire Marshall's report, Contractor take following actions:
 - a. Type Fire Marshall's hand written report.
 - b. Review and respond in writing to each item in report indicating status of item, proposed method of resolution, and time resolution to finished.
 - c. Transmit copies of report and response to Architect.
 - d. Correct deficiencies indicated on report.
 3. Repeat procedure until all deficiencies corrected and Occupancy Permit obtained.

END OF SECTION 01 4100

Walker County Schools Hvac Modifications
Fairyland Elementary School &
Cherokee Ridge Elementary

OFFICE OF COMMISSIONER OF INSURANCE

JOHN W. OXENDINE
COMMISSIONER OF INSURANCE
SAFETY FIRE COMMISSIONER
INDUSTRIAL LOAN COMMISSIONER
COMPTROLLER GENERAL

APPLICATION FOR 80% INSPECTION

SEVENTH FLOOR, WEST TOWER
FLOYD BUILDING
2 MARTIN LUTHER KING JR., DRIVE
ATLANTA, GEORGIA 30334
(404) 656-2056 TDD# (404) 656-4031

DATE _____

Engineering/Inspection Section
Safety Fire Division
Floyd Building, 620 West Tower
2 Martin Luther King, Jr. Drive
Atlanta, Georgia 30334

Dear Sir:

Pursuant to the provisions and regulations of the Georgia Safety Fire Law, I, _____,
_____ Owner/Authorized Representative

hereby submit application and request a preliminary inspection of _____,
_____ Project Name

located at _____, _____,
_____ Facility Name _____ Street

_____, _____,
_____ City _____ County

The facility was approved under Construction Permit No. _____ dated _____

_____, _____, (_____) _____,
_____ Job Site Contract _____ Title _____ Phone Number

The facility will be ready to be occupied on _____.

Signature of Applicant

Telephone Number (required)

Mailing Address

City

State/Zip Code

(This application and request is to be submitted 21 days prior to the date of the requested inspection.)

FM 50 (Revised 2/95)

If you are an individual with a disability and wish to acquire this publication in an alternative format, please contact the ADA Coordinator, Safety Fire Division, Office of Commissioner of Insurance, 2 Martin Luther King Jr. Drive, Atlanta, Georgia 30334, 404 656 2056, TDD#404 656-4031.

THE OFFICE OF COMMISSIONER OF INSURANCE DOES NOT DISCRIMINATE ON THE BASIS OF RACE, COLOR, NATIONAL ORIGIN, SEX, RELIGION, AGE OR DISABILITY IN EMPLOYMENT OR THE PROVISION OF PROGRAMS OR SERVICES.



OFFICE OF COMMISSIONER OF INSURANCE

JOHN W. OXENDINE
COMMISSIONER OF INSURANCE
SAFETY FIRE COMMISSIONER
INDUSTRIAL LOAN COMMISSIONER
COMPTROLLER GENERAL

APPLICATION FOR 100% INSPECTION

SEVENTH FLOOR, WEST TOWER
FLOYD BUILDING
2 MARTIN LUTHER KING JR., DRIVE
ATLANTA, GEORGIA 30334
(404) 656-2056 TDD# (404) 656-4031

DATE

Engineering/Inspection Section
Safety Fire Division
Floyd Building, 620 West Tower
2 Martin Luther King, Jr. Drive
Atlanta, Georgia 30334

Dear Sir:

Pursuant to the provisions and regulations of the Georgia Safety Fire Law, I, _____,
Owner/Authorized Representative

hereby submit application and request a preliminary inspection of _____,
Project Name

located at _____,
Facility Name Street

City County

The facility was approved under Construction Permit No. _____ dated _____

_____, _____, (_____) _____
Job Site Contract Title Phone Number

The facility will be ready to be occupied on _____.

Signature of Applicant

Telephone Number (required)

Mailing Address City State/Zip Code

(This application and request is to be submitted 21 days prior to the date of the requested inspection.)

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NOTICE OF COMMENCEMENT

TO THE CLERK OF THE SUPERIOR COURT OF _____ COUNTY, GEORGIA

Pursuant to O.C.G.A 44-14-361.5(b), the undersigned hereby gives Notice of Commencement of improvements to property including the following information:

1. Name, Address, and Telephone number of Contractor:

2. Name and Location of Project:

A legal description of the property upon which the improvements are being made is attached hereto as Exhibit "A", which is incorporated herein by this reference.

3. Name and address of true owner of property:

1. Name and address of person, other than true owner, at whose instance the improvements to the property are being made:

2. Name and address of Surety for the Performance and Payment Bonds, if any:

6. Name and address of Construction lender, if any:

The Clerk of the County is requested to file, record and index, this Notice of Commencement, in the records and indices maintained for such notices.

(Owner, Agent of Owner, Or Contractor)

Date _____

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 (name of public employer) has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned contractor will continue to use the federal work authorization program throughout the contract period and the undersigned contractor will contract for the physical performance of services in satisfaction of such contract only with subcontractors who present an affidavit to the contractor with the information required by O.C.G.A. § 13-10-91(b). Contractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

Federal Work Authorization User Identification Number

Date of Authorization

Name of Contractor

Name of Project

Name of Public Employer

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

Executed on _____, ___, 201__ 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 _____, 201__.

NOTARY PUBLIC

My Commission Expires:

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

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

Federal Work Authorization User Identification Number

Date of Authorization

Name of Subcontractor

Name of Project

Name of Public Employer

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

Executed on _____, ____, 201__ 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 _____, 201__.

NOTARY PUBLIC

My Commission Expires:

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

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

Federal Work Authorization User Identification Number

Date of Authorization

Name of Sub-subcontractor

Name of Project

Name of Public Employer

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

Executed on _____, ____, 201__ 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 _____, 201__.

NOTARY PUBLIC
My Commission Expires:

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DEFINITIONS

- A. Temporary Services and Facilities: For the purpose of this contract the term Temporary Services and Facilities shall be defined as project utility services, temporary construction and support facilities, temporary project security and protections systems and measures, temporary safety control measures, temporary and construction signage, temporary lighting and other materials and systems herein described.
 - 1. The term 'project utility services', 'temporary utility services' and 'utility services' shall include all utilities regardless of whether the utility is temporary or permanent in nature.
 - 2. Unless specifically noted otherwise herein, the contractor shall be responsible for all costs, including use costs, associated with temporary and permanent utilities for the duration of the project up to the date of final acceptance of the building.

1.03 DESCRIPTION OF REQUIREMENTS

- A. This Section specifies administrative and procedural requirements for temporary services and facilities, including such items as temporary utility services, temporary construction and support facilities, and project security and protection.
 - 1. All costs associated with the installation, maintenance, use and removal of temporary facilities and controls specified herein to be paid by the contractor unless specifically noted otherwise.
 - 2. In the absence of provisions to the contrary, the Contractor shall pay for all utilities services (water, gas, sewer, electricity) until the final certificate has been executed or until the work is occupied, whichever is the earlier.
 - 3. Unless specifically noted otherwise, no cost or usage charges for temporary services or facilities chargeable to Owner or Architect.
 - 4. Costs or use charges for temporary services or facilities not accepted as basis for claims for change-orders for added costs.
- B. Temporary utility services:
 - 1. Those required for use at project site include but not limited to following:
 - a. Water service and distribution.
 - b. Temporary electric power and light.
 - c. Telephone and Fax service.
 - d. Storm and sanitary sewer.
 - 2. Provide adequate utility capacity at each stage of construction.
 - a. Prior to availability of temporary utilities at site, provide trucked-in services for start-up of construction operations.
 - 3. Obtain and pay for temporary easements required to bring temporary utilities to project site, where Owner's permanent easement cannot be utilized for that purpose.
- C. Temporary construction and support facilities:
 - 1. Those required for project include but not limited to following:
 - a. Temporary heat.
 - b. Field offices and storage sheds.
 - c. Temporary roads and paving.
 - d. Sanitary facilities, including drinking water.
 - e. Dewatering facilities and drains.
 - f. Temporary enclosures.

- g. Hoists and temporary elevator use.
 - h. First aid station.
 - i. Project identification, bulletin boards and signs.
 - j. Waste disposal services.
 - k. Rodent and pest control.
 - l. Construction aids and miscellaneous general services and facilities.
2. Alternate temporary services and facilities, equivalent to those specified, may be used, subject to acceptance by Architect.
- D. Security and protection facilities and services:
- 1. Those required for project include but not limited to following:
 - a. Temporary fire protection.
 - b. Barricades, warning signs, lights.
 - c. Sidewalk bridge or enclosure fence for the site.
 - d. Environmental protection.
 - 2. Alternate security and protection methods or facilities, equivalent to those specified, may be used, subject to acceptance by Architect.

1.04 QUALITY ASSURANCE

- A. Regulations: Comply with requirements of local laws and regulations governing construction and local industry standards, in installation and maintenance of temporary services and facilities, including but not limited to following:
- 1. Building Codes, including local requirements for permits, testing and inspection.
 - 2. Health and safety regulations.
 - 3. Utility company regulations and recommendations governing temporary utility services.
 - 4. Police and Fire Department rules and recommendations.
 - 5. Police and Rescue Squad recommendations.
 - 6. Environmental protection regulations governing use of water and energy, and control of dust, noise and other nuisances.
- B. Standards: Comply with requirements of NFPA Code 241, "Building Construction and Demolition Operations", the ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA National Joint Guideline NJG-6 "Temporary Job Utilities and Services".
- 1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", as prepared jointly by AGC and ASC for industry recommendations.
- C. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities not intended to interfere with normal application of trade regulations and union jurisdictions applicable to work.
- D. Inspections:
- 1. Inspect and test each service before placing temporary utilities in use.
 - 2. Arrange for required inspections and tests by governing authorities, and obtain required certifications and permits for use.

1.05 SUBMITTALS

- A. Reports and Permits:
- 1. During progress of Work, submit copies of reports and permits required by governing authorities, or necessary for installation and efficient operation of temporary services and facilities.
 - 2. Submit copies of reports of tests, inspections, meter readings and similar procedures performed on temporary utilities before, during and after performance of work.
 - 3. Submit copies of permits, easements and similar documentation necessary for installation, use and operation of temporary utility services.
- B. Reports and permits required for use of temporary utility services and their use include but not limited to following:

1. Temporary heat.
2. Ventilation.
3. Temporary electric power and light.

1.06 JOB CONDITIONS

- A. General: Provide each temporary service and facility ready for use at each location when service or facility first needed to avoid delay in performance of work.
1. Maintain, expand as required and modify temporary services and facilities as needed throughout progress of Work.
 2. Do not remove until services or facilities no longer needed, or replaced by authorized use of completed permanent facilities.
 3. With establishment of job progress schedule, establish schedule for implementation and termination of service for each temporary utility.
 4. At earliest feasible time, and when acceptable to Owner and Architect, change over from use of temporary utility service to use of permanent service, to enable removal of temporary utility and eliminate possible interference with completion of work.
- B. Conditions of Use:
1. Operate temporary services and facilities in safe and efficient manner.
 2. Do not overload temporary services or facilities, and do not permit them to interfere with progress of work.
 3. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on jobsite.
- C. Temporary Utilities:
1. Do not permit freezing of pipes, flooding or contamination of water sources.
- D. Temporary Construction and Support Facilities:
1. Maintain temporary facilities in such manner as to prevent discomfort to users.
 2. Take necessary fire prevention measures.
 3. Maintain temporary support facilities in sanitary manner to avoid health problems and other deleterious effects.
- E. Security and Protection:
1. Maintain site security and protection facilities in safe, lawful and publicly acceptable manner.
 2. Take necessary measures to prevent erosion of the site.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. General: Provide new materials and equipment for temporary services and facilities; undamaged used materials and equipment in serviceable condition may be used, if acceptable to Architect.
1. Provide only materials and equipment recognized as suitable for intended use, by compliance with appropriate standards.
- B. Temporary Utilities: When local utility company provides only portion of temporary utility, provide remainder with matching, compatible materials and equipment.
1. Comply with utility company's recommendations.
- C. Water Hoses: Where shut-off nozzles used at water hose discharge, provide heavyduty abrasion-resistant hoses with pressure rating greater than maximum pressure of water distribution system.
1. Where non-potable water used, provide warning signs on discharge end of each length of hose.
- D. Electrical Service:
1. Comply with applicable NEMA, NECA and UL standards and governing regulations for materials and layout of temporary electric service, including those requirements included in Division-16 sections.

2. Voltage Differences:
 - a. Provide identification warning signs at power outlets which are other than 110-120 volt power.
 - b. Provide polarized outlets for plug-in type outlets, to prevent insertion of 110-120 volt plugs into higher voltage outlets.
 3. Ground-Fault Protection: Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for plug-in connection of power tools and equipment.
 4. Electrical Power Cords:
 - a. Use only grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic.
 - b. Use single lengths or use waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas of work.
 5. Lamps and Light Fixtures:
 - a. Provide general service incandescent lamps of wattage indicated or required for adequate illumination.
 - b. Protect lamps with guard cages or tempered glass enclosures, where fixtures exposed to breakage by construction operations.
 - c. Provide exterior fixtures where fixtures are exposed to weather or moisture.
- E. Temporary Construction and Support Facilities: Provide facilities that can be maintained properly throughout their time at jobsite.
1. Heating Units: Provide temporary heating units tested and labeled by UL, FM or another recognized trade association related to fuel being consumed.
 2. Temporary Offices and Similar Construction:
 - a. For temporary offices, fabrication shops, storage sheds and similar construction, provide either standard prefabricated or mobile units or the equivalent job-built construction.
 - b. Provide insulated, weathertight units, heated or air-conditioned where indicated, lockable entrances, operable windows, roofing, foundations adequate for normal loading, including wind loads, serviceable finishes, and mechanical and electrical equipment necessary to achieve ambient conditions indicated.
 3. Fire-Resistance:
 - a. Provide fire-resistant construction for offices, shops, and sheds located within construction work area, or within 50 feet of building lines.
 - b. Provide UL labeled Class "A" fire treated lumber and plywood for framing, sheathing and siding, and UL Class "A" asphalt shingle or roll roofing.
 - c. Provide gypsum board (drywall) interior walls.
 4. Self-Contained Toilet Units: Provide single-occupant self-contained toilet units of chemical, aerated recirculating, or combustion type, properly vented and fully enclosed with glass fiber reinforced polyester shell or similar non-absorbent material.
 5. Tarpaulins:
 - a. Provide waterproof, fire-resistant, UL labeled tarpaulins with max. flame-spread rating of 15.
 - b. For temporary enclosures where work being or will be performed, provide translucent tarpaulins made of nylon reinforced laminated polyethylene to admit max. amount of daylight and reduce need for temporary lighting.
 6. First Aid Supplies: Comply with governing regulations and recognized recommendations within construction industry.
 7. Drinking Water: Provide potable water approved by local health authorities.
 - a. Where well water used, comply with local health authorities recommendations for type and frequency of testing water for potability.
 8. Sign Materials: For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thicknesses indicated.
 - a. Provide exterior grade acrylic-latex-base enamel for painting panels and applying graphics.
- F. Security and Protection Facilities:
1. Fire Extinguishers: Provide Type "A" fire extinguishers for temporary offices and similar spaces where minimal danger of electrical or grease-oil-flammable liquid fires exists.
 - a. In other locations provide type "ABC" dry chemical extinguishers, or combination of several extinguishers of NFPA recommended types for exposures in each case.
 2. Plywood: For fences and vision barriers, provide exterior types, min. 3/8" thick plywood, prime and finish painted.

3. Open-Mesh Fencing: Provide No. 11-gage galvanizing chain link fabric fencing 6 feet high with galvanized barbed wire top strand and galvanized steel pipe posts, 1-1/2" I.D. for line posts, and 2-1/2" I.D. for corner posts.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. General:
 1. Use qualified tradesmen for installation of temporary services and facilities.
 2. Locate temporary services and facilities where they will serve entire project adequately and result in min. interference with performance of Work.
- B. Relocate, modify and extend services and facilities required during course of work to accommodate entire work of Project.

3.02 TEMPORARY UTILITY INSTALLATION

- A. Temporary Water Service; Renovation and Modification activities:
 1. The contractor will be permitted to use the owner's domestic water service as described herein. The cost of the water, for the duration of the project shall be paid by the **OWNER**.
 - a. The Contractor may obtain water from lawn faucets at exterior of building.
 - b. Contractor, at his expense, to provide additional temporary water as required..
 - c. Contractor shall install temporary back flow preventor at each location of connection to existing water system.
 2. The contractor is required to provide all materials and labor necessary to make connections, protect owners services, and return service back to original condition.
 - a. The contractor is required to protect the owner's utility equipment and replace the same, at no cost to the contract, should the utilities become damaged as a result of work performed under this contract.
- B. Water Service:
 1. General: Install water service and distribution piping of sizes and pressures adequate for construction purposes during construction period and until permanent service is use, including but not limited to following uses:
 - a. Construction processes.
 - b. Fire protection.
 - c. Drinking water.
 - d. Sanitary facilities.
 - e. Cleaning.
 - f. Plant and lawn watering.
 2. Where available supply of potable water inadequate, provide non-potable water for purposes other than drinking and washing.
 - a. Provide warning signs at each outlet of non-potable water.
 3. Obtain water service from nearby water main of local water authority, as permitted by governing authority.
 - a. Pay water service use charges, whether metered or otherwise, for all water used by entities authorized to be at or to perform work at project site.
 - b. Exercise control over usage in effort to conserve water.
 4. Provide temporary water service with 2" meter and shut-off valve near connection to water main.
 5. Soon as construction operations at each floor level require water, extend service, full height of building to form temporary water and fire water standpipe.
 6. Provide distribution piping for temporary water to each location of use.
 - a. Provide one outlet for each floor level of construction spaced so that water reached with 100 foot length of hose.
 - b. Provide one 3/4" flexible rubber hose 100 feet long with adjustable nozzle, at each outlet where work in progress requires water.

- c. Maintain hose connections and outlet valves in leakproof condition.
 - 1) Where finish work below an outlet might be damaged by spillage or leakage, provide drip pan of suitable size to minimize possibility of water damage.
 - 2) Drain water promptly from pans as it accumulates.
- 7. Pumping:
 - a. Where water pressure is to provide min. 20 psig pressure at highest point of use, provide temporary pumps to supply required flow of water and min. of 30 psig static pressure at highest point of use.
 - b. Equip pumps with adequate surge and storage tanks and automatic controls to supply water uniformly, at reasonable pressures.
- 8. Sterilization:
 - a. Except piping of non-potable water, sterilize temporary water piping prior to use.
 - b. Refer to Division-15 sections for procedures.
- C. Temporary Electricity, Service; Renovation and Modification:
 - 1. The contractor will be permitted to use the owner's electrical service as described herein. The cost of the electricity, for the duration of the project shall be paid by the **OWNER**.
 - a. The Contractor may obtain electricity from existing electrical panels and permanent electrical convenience outlets.
 - b. All electrical work and connections to be performed by licensed electricians.
 - c. Contractor, at his expense, to provide additional temporary electricity as required..
 - 2. The contractor is required to provide all materials and labor necessary to make connections, protect owners services, and return service back to original condition.
 - a. The contractor is required to protect the owner's utility equipment and replace the same, at no cost to the contract, should the utilities become damaged as a result of work performed under this contract.
- D. Temporary Electric Power Service:
 - 1. General:
 - a. Provide weatherproof, grounded temporary electric power service and distribution system of sufficient size, capacity, and power characteristics to accommodate performance of work during construction period.
 - b. Whenever overhead floor or roof deck installed, install temporary lighting adequate to provide sufficient illumination for safe work and traffic conditions in every area of work.
 - 2. Temporary Service:
 - a. Install service and grounding in compliance with National Electric Code (NFPA 70).
 - b. Include necessary meters, transformers, overload protected disconnect and main distribution switch gear.
 - c. Install electric power service underground except where overhead service must be used to avoid construction conflicts or to comply with governing regulations.
 - d. Connect temporary service to local electric power company main in manner directed by company officials.
 - 1) Pay use charges, whether metered or otherwise, for electricity used by all entities authorized to be at or to perform work at project site.
 - 2) Exercise control over power usage in effort to conserve energy.
 - 3. Provide temporary service with automatic ground-fault interrupter features, activated from circuits of system.
 - 4. Power Distribution System:
 - a. Provide circuits of adequate size and proper characteristics for each use.
 - b. In general run wiring overhead, and rise vertically where wiring least exposed to damage from construction operations.
 - c. Provide rigid steel conduit or equivalent raceways for wiring exposed on grade, floors, decks or other areas of possible damage or abuse.
 - d. Provide metal conduit, tubing or armored cable for protection of temporary power wiring where exposed to possible damage during construction operations.
 - e. Where permitted by code, wiring of circuits not exceeding 110-120 Volt 20 Amp rating, and wiring of lighting circuits may be non-metallic sheathed cable in areas where located overhead and exposed for surveillance.

- f. Do not wire temporary lighting with plain, exposed (insulated) electrical conductors.
 - g. Provide metal enclosures or boxes for wiring devices.
 - h. Provide overload-protected disconnect switch for each temporary circuit and each temporary lighting circuit, located at power distribution center.
5. For power hand tools and task lighting, provide temporary 4-gang outlets at each floor level, spaced so that 100 foot extension cord can reach each area of work.
- a. Provide separate 110-120 Volt, 20 Amp circuit for each 4-gang outlet (4 outlets per circuit).
- E. Temporary Lighting:
- 1. Provide local switching of temporary lighting, spaced to allow lighting to be turned off in patterns to conserve energy and retain light suitable for work-in-progress, access traffic, security check and project lock-up.
 - 2. Provide min. one 200-watt incandescent lamp per 1000 square feet of floor area, uniformly distributed, for general construction lighting, or equivalent illumination of similar nature.
 - a. In corridors and similar traffic areas provide one 100-watt incandescent lamp every 50 feet.
 - b. In stairways and at ladder runs, provide lamp minimum per story, located to illuminate each landing and flight.
 - 3. Install and operate temporary lighting to fulfill security and protection requirements, without necessity of operating entire temporary lighting system.
- F. Temporary Telephones and Fax:
- 1. Arrange for local telephone company to install temporary service to Project.
 - 2. Provide service of type and capacity indicated in other Division-1 sections.
 - 3. Install telephone on separate line for each temporary office and first aid station; provide fax in each office trailer.
 - a. Where office has more than two occupants, install telephone for each additional occupant or pair of occupants.
 - 4. At each telephone location post list of important telephone numbers, including following:
 - a. Local police and fire department.
 - b. Doctor.
 - c. Ambulance service.
 - d. Contractor's temporary and home office.
 - e. Architect's temporary and home office.
 - f. Engineer's temporary and home office.
 - g. Owner's temporary and home office.
 - h. Principal subcontractors' temporary and home offices.
- G. Sewers and Drainage:
- 1. General: If existing sewers available for temporary drainage near site prior to completion of permanent sewers, provide temporary connections to remove effluent that can be lawfully discharged into sewers.
 - a. If existing sewers cannot be used for discharge, provide drainage ditches, dry wells, waste stabilization ponds and similar discharge facilities to remove effluent that can be lawfully discharged in that manner.
 - b. If neither existing sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off site in lawful manner.
 - 2. Before discharge of liquid wastes into sewers or drainage facilities, filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways.
 - a. Provide temporary filter beds, settlement tanks, separators and similar devices to purify effluent to acceptable levels.
 - 3. Connect temporary sewers to municipal sewer systems in manner directed by sewer department officials.
 - 4. Maintain temporary sewers and drainage facilities in clean, sanitary condition, ready for maximum use.
 - a. Following heavy usage, restore normal conditions promptly.
 - b. Provide and maintain temporary earthen embankments and similar barriers in and around construction excavations and subgrade construction, sufficient to prevent flooding of work by runoff of storm water from heavy rain storms.

3.03 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

- A. General:
1. Provide reasonably neat and uniform appearance in temporary construction and support facilities acceptable to Architect and Owner.
 2. Locate field offices, storage and fabrication sheds and other support facilities for easy access to Work.
 3. Position offices so that windows give best possible view of construction activities.
 4. Except as otherwise indicated, make change-over from use of temporary services and facilities to use of permanent services and facilities at earliest feasible date at each portion of building, to minimize hazards and interferences with performance of Work.
 5. Maintain field offices, storage and fabrication sheds, temporary sanitary facilities, waste collection and disposal systems, and project identification and temporary signs until near Final Acceptance.
 - a. Immediately prior to Final Acceptance remove these facilities.
 - b. Personnel remaining at site beyond Final Acceptance permitted to use certain permanent facilities, under restricted use conditions acceptable to Owner.
- B. Temporary Heat:
1. Provide temporary heat where indicated or needed for performance of Work, curing or drying of recently installed work or protection of work in place from adverse effects of low temperatures or high humidity.
 2. Select facilities known to be safe and without deleterious effect upon the work in place or being installed.
 3. Coordinate with ventilation requirements to produce indicated ambient condition required and minimize consumption of fuel or energy.
 4. Maintain min. temperature of 45°F (7°C) in permanently enclosed portions of building and areas where finished work installed.
 5. Heating Facilities: Except where conditions make it necessary to use another system, and where use of permanent heating system available and authorized, provide properly vented self-contained LP gas or fuel oil heaters with individual space thermostatic control for temporary heat.
 - a. Limit use of gasoline-burning space heaters to indirect-fired type, located outside building space or space being heated.
 - b. Use gasoline-burning space heaters only where specified system for temporary heating cannot be used.
 - c. Do not use open burning or salamander type heating units where prohibited by governing regulations, or when combustible materials located in or near space being heated, or when work installed or being installed includes work exposed to view in completed project.
- C. Field Offices:
1. Provide temporary field offices of for use by Contractor, Owner and Architect located as directed by the Owner and complying with the following:
 - a. Building shall afford protection against weather with a minimum of one (1) door, at least one window. Window to be equipped with adjustable blinds and insect screens.
 - b. Provide field offices with light colored resilient floor covering material and painted drywall wall and ceiling finishes.
 - c. Provide vented space heater, capable of maintaining uniform indoor temperature of 68°F (20°C), and air-conditioning unit capable of maintaining max. indoor temperature of 72°F (24°C).
 - d. Provide switch controlled fluorescent light fixtures capable of maintaining average illumination of 20 foot-candles at desk height, and 110-120 volt duplex outlets spaced at 12' intervals, with min. of one per wall in each room.
 - e. Furnish suitably with not less than one lockable desk and chair, 2 guest chairs, 4-drawer file cabinet with lock, plan table, plan rack, and desk lamp.
 - f. Equip office with drinking-water cooler and private toilet complete with water closet, lavatory and mirror-medicine cabinet unit.
 - g. Maintain one complete readable updated set of drawings and specifications with all addenda, post-bid addenda and change orders posted.
 - h. Maintain one complete set of reviewed shop drawings, completed with Architect's and engineer's review comments accessible to the Owner and Architect.

2. Provide, as part of field office, or as separate facility, room min. of 10'-0" X 12'-0" for exclusive use by Owner and project architect equipped and furnished as described for contractor's office above.
 - a. Provide with lockable door.
 - b. Furnish with plan rack and table.
 3. Provide, as part of field office, or as separate facility, room min. of 240 sq. ft. for project meetings, furnished with conference table, 8 folding chairs and tackboard
- D. Storage and Fabrication Sheds:
1. Install storage and fabrication sheds, properly sized, furnished and equipped, as required to accommodate work.
 2. Comply with applicable provisions specified elsewhere for distribution and use of temporary utilities.
 3. Sheds may be open shelters or fully enclosed spaces, whether within building construction area or elsewhere on site.
- E. Temporary Roads and Paving:
1. To fullest extent possible, locate temporary roads and paving for storage areas and temporary parking, in same locations as permanent facilities for similar uses.
 2. To incorporate temporary paving provisions, review significant modifications of permanent paving requirements with Architect for acceptance of proposed improvements.
 3. Coordinate development of temporary roads and paved areas with grading and compaction of subgrade, installation and stabilization of subbase and installation of base and finish courses of permanent paving.
 - a. Coordinate development in manner to minimize exposure of incomplete work to deterioration and need to rework installations, to provide adequate temporary roads and paving during course of work, and to result in completion of permanent roads and paved areas new in appearance and without damage or deterioration at time of Owner's occupancy.
 - b. Delay installation of final course of permanent asphalt concrete paving in areas exposed to temporary use, until immediately before Final Acceptance.
 - 1) Coordinate with normal weather conditions to avoid unsatisfactory results.
 4. Extend temporary paving in and around site construction area as necessary to accommodate following:
 - a. Delivery and storage of materials.
 - b. Fabrication operations.
 - c. Use of equipment, including truck cranes.
 - d. Administration and supervision.
 - e. Safety and protection activities.
 5. Provide temporary traffic control facilities at junction of temporary roads with public roads, including warning signs for public traffic and "STOP" signs for access road entrance onto public roads.
 - a. Comply with requirements and recommendations of local traffic authorities.
 6. Paving:
 - a. Construct and maintain temporary roads and paving to adequately support indicated loading and withstand exposure to traffic during construction period.
 - b. Provide reasonably level graded and well drained subgrade of satisfactory soil material, as defined in Division-2 sections, well compacted to min. 95% of max. dry density in top 6".
 - c. Provide gravel paving course of well graded subbase material min. 3" thick, roller compacted to level, smooth, dense surface.
 - d. Provide dust control treatment consisting of recognized "roadoil" or other petro-chemical compound known to be non-polluting and non-tracking.
- F. Sanitary Facilities:
1. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures.
 2. Comply with governing regulations including safety and health codes for the type, number, location, operation and maintenance of fixtures and facilities; provide min. specified requirements.
 - a. Install in locations that best serve Project's needs.
 3. Locate toilets and drinking water fixtures so that no one within construction area need walk more than 2 stories vertically or 200 feet horizontally to reach these facilities.
 - a. Supply and maintain toilet tissue, paper towels, paper cups and similar disposable materials appropriate for each facility.
 - b. Provide appropriate covered waste containers for used material.

4. Toilets:
 - a. Install self-contained toilet units or water and sewer connected temporary toilet facilities, to extent permitted by governing regulations.
 - b. Use of pit-type privies not permitted.
 - c. Provide lavatories, mirrors, urinals (where applicable) and water closets in water and sewer connected units.
 - 1) Provide only potable water at lavatories.
 - 2) Provide individual compartments for water closets where unit is intended for occupancy by more than one person.
 - 3) Provide suitable enclosure with nonabsorbent sanitary finish materials and adequate heat, ventilation and lighting.
 5. Drinking Water Fixtures:
 - a. Provide drinking water fountains where and when piped potable water reasonably accessible from permanent or temporary lines.
 - 1) Otherwise, provide containerized tap-dispenser bottled-water type drinking water units, including paper supply.
 - b. Where power accessible, provide electric drinking water coolers to maintain dispensed water temperature at 45 to 55°F (7 to 13°C).
- G. Janitorial Services:
1. General:
 - a. Provide daily janitorial services for temporary offices, first aid stations, toilets, wash facilities, lunchrooms and similar areas.
 - b. Require users of other temporary facilities to help maintain clean and orderly premises.
- H. Dewatering Facilities and Drains:
1. For temporary drainage and dewatering facilities and operations not directly associated with performance of work included under individual work sections, comply with dewatering requirements of applicable Division-2 sections.
 2. Where feasible, utilize same facilities.
 3. Maintain site, excavations and construction free of water.
 4. Dispose of rainwater in lawful manner not resulting in flooding project or adjoining property, nor endanger either permanent work or temporary facilities.
 5. Provide temporary drainage where roofing or similar waterproof deck construction completed prior to connection and operation of permanent drainage piping system, provide temporary drainage.
- I. Temporary Enclosures:
1. At earliest practical time provide temporary enclosure of materials, equipment, work in progress and completed portions of Work to provide protection to Work and employees from effects of exposure, foul weather, other construction operations, and similar activities on site.
 2. Provide temporary enclosures where temporary heat needed and permanent building enclosure not yet completed, and there is no other adequate provision for containment of temporary heat.
 3. Coordinate enclosures with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 4. Enclosure: Provide temporary enclosures by installing tarpaulins or equivalent materials securely, using minimum of wood framing and other combustible materials.
 - a. Individual openings of 25 square feet or less may be closed with plywood or similar materials.
 - b. Close openings through floor or roof decks and other horizontal surfaces with substantial load-bearing wood-framed or similar construction.
- J. Hoists Use:
1. Provide adequate facilities for hoisting materials and employees.
 2. Do not permit employees to ride hoists which comply only with requirements for hoisting materials.
 3. Contractor responsible for selection of type, size and number of facilities.
 4. Truck cranes and similar devices used for hoisting considered as "tools and equipment" and not temporary facilities.

- K. Project Identification and Temporary Signs:
1. Prepare project identification and other temporary signs.
 2. Project identification sign:
 - a. Facing: 3/4" CDX plywood
 - b. Size: Min. 8'-0" X 12'-0"
 - c. Quantity: One Each
 - d. Engage experienced sign painter to apply graphics in neat professional manner.
 3. Support on suitable posts or framing of treated wood or steel.
 - a. Size: Min. 4' X 4".
 - b. Quantity: Min 4 each
 4. Maintain signs in manner to properly inform public and persons seeking entrance to Project.
 5. Do not permit installation of unauthorized signs visible outside site.
 6. Temporary Signs:
 - a. Prepare temporary signs within site which will provide directional assistance and information to construction personnel and visitors to help locate following:
 - 1) Access roads and parking.
 - 2) Offices and first aid stations.
 - 3) Telephones.
 - 4) Emergency exits.
 - 5) Fire protection facilities.
 - 6) Barricades and obstructions.
 - 7) Hazardous elements of construction work.
 7. Temporary Lighting:
 - a. Install exterior lights, yard lights and sign lights so that signs clearly visible when work being performed.
 - b. Operate project identification sign lighting from dusk until 10:00 PM every calendar day.
- L. Collection and Disposal of Wastes:
1. Establish system for daily collection and disposal of waste materials from construction areas and elsewhere on site.
 2. Enforce requirements strictly.
 3. Do not hold collected materials at site longer than 7 days during normal weather or 3 days when daily temperature expected exceed 80°F (27°C).
 4. Handle hazardous, dangerous, or unsanitary waste materials separately from other inert waste by containerizing appropriately.
 5. Dispose of waste material in lawful manner.
 6. Burying or burning of waste materials on site not permitted.
 7. Washing waste materials down sewers or into waterways not permitted.
 8. Provide rodent proof containers located on each floor level of construction work, to encourage depositing of garbage and similar wastes by construction personnel.
- M. Rodent and Pest Control:
1. Early in construction process before deep foundation work completed, retain recognized local exterminator or insect-and-pest control company to recommend practices to minimize attraction and harboring of rodents, roaches and other pests.
 2. Employ service to perform extermination and control procedures at regular intervals so that Project relatively free of pests and their residues at Final Acceptance.
 3. Perform control operations in lawful manner using environmentally safe materials.
- N. Construction Aids and Miscellaneous Services and Facilities:
1. Design, construct, and maintain construction aids and miscellaneous general services and facilities as needed to accommodate performance of work.
 2. Construction aids and miscellaneous general services and facilities include, but not limited to following:
 - a. Temporary stairs and ladders.
 - b. Guardrails and barriers.
 - c. Walkways.

3. Stairs:
 - a. Provide temporary stairs where ladders not adequate for performance of work, and until permanent stairs available.
 - b. Cover finished permanent stairs exposed to occupants' use, with durable protective covering of plywood or similar material so finishes are undamaged at time of acceptance.
4. Walkways:
 - a. Install and maintain temporary walkways around work and to field offices, toilets and similar places.
 - b. Construct walkways of washed, well graded gravel 6" deep by 36" wide, or of duckboard units 30" wide with 1 x 6 rough-sawn crossboards on pair of 3 x 4 runners.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Provide reasonably neat and uniform appearance in security and protection facilities acceptable to Architect and Owner.
- B. Except for utilization of permanent fire protection facilities, as soon as available in each area, do not change over from use of temporary security and protection facilities to use of permanent facilities until Final Acceptance, or for longer periods of time as requested by Architect.
- C. Temporary Fire Protection:
 1. Until fire protection needs may be fulfilled by permanent facilities, install and maintain temporary fire protection facilities of types needed to adequately protect against reasonably predictable and controllable fire losses.
 2. Comply with applicable recommendations of NFPA Standard 10 "Standard for Portable Fire Extinguishers".
 3. Locate fire extinguishers where most convenient and effective for their intended purpose, but provide min. one extinguisher on each floor at or near each usable stairwell.
 4. Store combustible materials in containers in recognized fire-safe locations.
 5. Develop and supervise an overall fire prevention and first-aid fire protection program for personnel at project site.
 - a. Review needs with local fire department officials and establish procedures to be followed.
 - b. Instruct personnel in methods and procedures to be followed.
 - c. Post warnings and information and enforce strict discipline.
 - d. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires.
 - e. Prohibit smoking in hazardous fire exposure areas.
 - f. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of ignition for possible fires.
 6. Where temporary water outlets available, provide hoses of sufficient length to reach construction areas.
 - a. Hang hoses with warning sign, to effect that hoses are for fire protection purposes and not to be removed.
 - b. Match hose size with outlet and equip with suitable nozzles.
- D. Permanent Fire Protection:
 1. At the earliest feasible date in each area of the project, complete installation of permanent fire protection facility, including connected services, and place into operation and use.
 2. Instruct key personnel at the site on how to use facilities which may not be self-explanatory.
- E. Barricades, Warning Signs and Lights:
 1. Comply with recognized standards and code requirements for erection of substantial, structurally adequate barricades where needed to prevent accidents and losses.
 2. Paint with appropriate colors, graphics and warning signs to inform personnel at site and public, of hazard being protected against.
 3. Provide lighting where appropriate and needed, including flashing red lights where appropriate.

- F. Enclosure Fence:
 - 1. General: When excavation or other substantial elements of Work begin, install general enclosure fence with suitable lockable entrance gates.
 - 2. Locate where indicated, or if not indicated, enclose substantially entire site or portion thereof determined sufficient to accommodate entire construction operation.
 - 3. Install in manner to prevent persons, dogs and similar animals from easily entering site, except by way of entrance gates when open.
 - 4. Except as otherwise indicated, provide open-mesh, chain-link fencing with posts set in compacted mixture of gravel and earth.
 - 5. Except as otherwise indicated, provide vision-proof plywood type fencing, 8-feet high, framed with four 2 x 4 rails, and with treated wood posts spaced max. 8-feet apart.
- G. Security Enclosure and Lockup:
 - 1. Install substantial and durable general temporary enclosure of partially completed areas of construction.
 - 2. Provide locking entrances adequate to prevent unauthorized entrance, vandalism, theft and similar deleterious effects and violations of project security.
 - 3. Storage: Where materials and equipment temporarily stored, prior to and during construction, and are of substantial value or are attractive for possible theft, provide secure lockup and enforce strict discipline in connection with timing of installation and release of materials, so that opportunity for theft and vandalism minimized.
- H. Environmental Protection:
 - 1. Provide general protection facilities, operate temporary facilities, conduct construction activities, and enforce strict discipline for personnel on site in ways and by methods that comply with environmental regulations, and that minimize possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result from performance of work at site.
 - 2. Avoid the use of tools and equipment which produce harmful noise.
 - 3. Restrict use of noise making tools and equipment to hours of use to minimize noise complaints from persons or firms near project site.

3.05 OPERATION, TERMINATION AND REMOVAL

- A. Supervision:
 - 1. Enforce strict discipline in use of temporary services and facilities at site.
 - 2. Limit availability of temporary services and facilities to essential and intended uses to minimize waste and abuse.
 - 3. Do not permit temporary installations to be abused or endangered.
 - 4. Do not allow hazardous, dangerous or unsanitary conditions to develop or persist on project site.
- B. Maintenance:
 - 1. Operate and maintain temporary services and facilities in good operating condition throughout time of use and until removal authorized.
 - 2. Protect from damage by freezing temperatures and similar elements.
 - 3. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on 24-hour day basis where required to achieve indicated results in Work and to avoid possibility of damage to Work or to temporary facilities.
- C. Protection:
 - 1. Prevent water filled piping from freezing, by use of ground covers, insulation, by keeping drained or by temporary heating.
 - 2. Maintain distinct markers for underground lines.
 - 3. Protect from damage during excavation operations.

- D. Termination and Removal: Unless Architect requests it be maintained for longer period of time, remove each temporary service and facility promptly when need for it or substantial portion of it has ended, or when replaced by authorized use of permanent facility, or no later than Final Acceptance.
 - 1. Complete, or, if necessary, restore permanent work delayed because of interference with temporary service or facility.
 - 2. Repair damaged work, clean exposed surfaces and replace work which cannot be satisfactorily repaired.
- E. Materials and facilities that constitute temporary services and facilities are and remain property of Contractor.
 - 1. Owner reserves right to take possession of project identification signs.
- F. Remove temporary roads and paving materials not intended for or acceptable for integration into permanent paving.
 - 1. Where area shown intended for landscape development, remove soil and aggregate fill not complying with requirements for fill or subsoil in landscape area.
 - 2. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances which might impair growth of plant materials or lawns.
 - 3. Repair or replace street paving, curbs and sidewalks at temporary entrances, as required by governing authority.
- G. At Final Acceptance, clean and renovate permanent services and facilities used to provide temporary services and facilities during construction period, including but not limited to following:
 - 1. Replace air filters and clean inside of ductwork and housings.
 - 2. Replace significantly worn parts and parts subject to unusual operating conditions.
 - 3. Replace lamps in lighting system that are burned out or noticeably dimmed by substantial hours of use.

END OF SECTION 01 5000

SECTION 01 6300
PRIOR-APPROVED PRODUCT OPTIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Furnish and install products specified, under options and conditions for substitutions stated in this Section and referenced in General Conditions.

1.02 DESCRIPTION OF WORK

- A. Provide products specified within technical provisions of specifications.
- B. Contractors wishing to use products other than those specifically listed in contract documents shall request "prior approval" of proposed product in accordance with the provisions of this section.
- C. Where contractor wishes to use products under the "Or-Equal" provision of the specifications, approval of the product(s) shall be in accordance with this section.
 - 1. Architect will not consider product substitutions under the "Or-Equal" clause after receipt of bids.
- D. Product Substitution after receipt of bids included in Section 016310, Products and Substitutions.

1.03 PRODUCTS LISTS

- A. Within bidding period, non-listed manufacturers of items specified by reference standards submit, to Architect, five copies of complete list of major Products proposed for installation.
- B. Tabulate products by specification section number and title.
- C. For products only by reference standards, list for each product:
 - 1. Name and address of manufacturer
 - 2. Trade name
 - 3. Model or catalog designation
 - 4. Manufacturer's data
 - a. Reference standards
 - b. Performance test data

1.04 CONTRACTOR'S OPTIONS

- A. For products specified only by reference standard, select product meeting that standard, by any manufacturer.
- B. For products specified by naming several products or manufacturers, select any one of products and manufacturers named complying with specifications.
- C. For products specified by naming several products or manufacturers and stating "or equivalent", "or equal", or "or approved equal" submit request for substitutions, for any product or manufacturer not specifically named.

1.05 SUBSTITUTIONS

- A. Contractor's submit Base Bid in strict accordance with the Contract Documents.
 - 1. Contractor has option of requesting substitutions during bidding period by submitting completed substitution request minimum of 10 days prior to Bid Date.
 - 2. Products submitted on requests received by Architect 10 days prior to Bid Date included in addendum, if acceptable.
 - 3. After end of that period, requests considered only in case of product unavailability or other conditions beyond control of Contractor.

- B. Submit separate request for each substitution; support each request with following:
 - 1. Complete data substantiating compliance of proposed substitution with requirements of Contract Documents.
 - a. Product identification, including manufacturer's name and address.
 - b. Manufacturer's literature; identify:
 - 1) Product description
 - 2) Reference standards
 - 3) Performance and test data
 - c. Samples, as applicable
 - d. Name and address of similar projects on which product used, and date of each installation.
 - 2. Itemized comparison of proposed substitution with product specified; list significant variations.
 - 3. Data relating to changes in construction schedule.
 - 4. Any effect of substitution on separate contracts.
 - 5. List of changes required in other work or products.
 - 6. Designation of required license fees or royalties.
 - 7. Designation of availability of maintenance services, sources of replacement materials.
- C. Substitutions not considered for acceptance when:
 - 1. They are indicated or implied on shop drawings or product data submittals without formal request from Contractor.
 - 2. Acceptance requires substantial revision of Contract Documents.
 - 3. In judgement of Architect, do not include adequate information necessary for complete evaluation.
 - 4. If requested after Contract Award directly by Trade-Contractor, Sub-Contractor or Supplier.
- D. Do not order or install substitute products without written acceptance of Architect.
- E. Architect will determine acceptability of proposed substitutions.

1.06 CONTRACTOR'S REPRESENTATION

- A. In making formal request for substitution Contractor represents following:
 - 1. He has investigated proposed product and determined that it is equivalent to or superior in all respects to that specified.
 - 2. He will provide same or better warranties or bonds for substitution as for product specified.
 - 3. He will coordinate installation of accepted substitution into Work, and make such changes required for Work to be complete in all respects.
 - 4. He waives claims for additional costs caused by substitution which may subsequently become apparent.

1.07 ARCHITECT DUTIES

- A. Review Contractor's request for substitutions with reasonable promptness.
- B. Notification to Contractor: In accordance with General Conditions, Article E-03.

1.08 SUBSTITUTION REQUEST FORM

- A. Form attached to this Section.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

END OF SECTION 01 6300

SUBSTITUTION REQUEST FORM

TO: _____

PROJECT: _____

We hereby submit for your consideration following product instead of specified item for above project:

<u>DRAWING</u>	<u>SPEC. SECT. NO</u>	<u>PARAGRAPH</u>	<u>SPECIFIED ITEM</u>
_____	_____	_____	_____

Proposed Substitution: _____

(NOTE: Attach complete information on changes to Drawings and/or Specifications which proposed substitution will require for proper installation. Submit, with request, all necessary samples and substantiating data to prove equal quality and performance to that specified. Clearly mark manufacturer's literature to indicate equality in performance.)

Fill in Blanks Below:

A. Does substitution affect dimensions shown on the Drawings? Yes _____ No _____

If yes, clearly indicate changes. _____

B. Will undersigned pay for changes to building design, including engineering and detailing costs caused by requested substitution? Yes _____ No _____

If no, fully explain: _____

C. What effect does substitution have on other Contracts or other Trades?

D. What effect does substitution have on construction schedule? _____

E. Manufacturer's warranties of proposed and specified items are:

Same _____ Different _____ (explain on attachment).

F. Reason for request: _____

G. Itemized comparison of specified item(s) with the proposed substitution;

list significant variations: _____

H. Accurate cost data comparing proposed substitution with product specified:

I. Designation of maintenance services and sources: _____

(Attach additional sheets if required.)

CERTIFICATION OF EQUAL PERFORMANCE
AND ASSUMPTION OF LIABILITY FOR
EQUAL PERFORMANCE

For Use By Architect:

____ Accepted ____ Accepted as Noted
____ Not Accepted ____ Received Too Late

The undersigned states that the function,
appearance and quality are equivalent or
superior to the specified item.

Submitted By:

Signature Title

By _____

Firm

Date _____

Address

Remarks _____

Telephone Date

Signature shall be by person having authority
to legally bind his firm to the above terms.
Failure to provide legally binding signature
will result in rejection of proposed substitution

**SECTION 01 6310
PRODUCT SUBSTITUTIONS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF REQUIREMENTS

- A. Substitutions: Contractor's requests for changes in products, materials, equipment and methods of construction required by Contract Documents, after receipt of bids considered requests for "substitutions", and subject to requirements specified herein.
- B. Following not considered substitutions:
 - 1. Revisions to Contract Documents, where requested by Owner, Architect or Engineer considered as "changes" not substitutions.
 - 2. Substitutions requested during bidding period, accepted prior to Contract Date, are included in Contract Documents and not subject to requirements for substitutions herein specified.
 - 3. Specified Contractor options on products and construction methods included in Contract Documents are choices available to Contractor and not subject to requirements for substitutions herein specified.
 - 4. Except as otherwise provided in Contract Documents, Contractor's determination of and compliance with governing regulations and orders as issued by governing authorities do not constitute "substitutions" and do not constitute basis for change orders.
- C. Prior approved product options specified in Section 016300, Prior Approved Product Options. Section 016300 Includes:
 - 1. Approval of products and substitutions requested during bidding period.
 - 2. Approval of products during bidding period, where said request is based on the assumption that the product complies with the "Or-Equal" provision.

1.03 DEFINITIONS AND STANDARDS

- A. Definitions: Definitions not intended to negate meaning of other terms used in Contract Documents, including such terms as, "specialties", "systems", "structure", "finishes", "accessories", "furnishings", "special construction" and similar terms.
 - 1. Such terms are self-explanatory and have recognized meanings in construction industry.
- B. "Products": Items purchased for incorporation in Work, regardless of whether specifically purchased for project or taken from Contractor's previously purchased stock.
 - 1. "Product" as used herein includes terms "material", "equipment", "system" and other terms of similar intent.
- C. "Named Products": Products identified by use of manufacturer's name for product, including such items as make or model designation, as recorded in published product literature, of latest issue as of date of Contract Documents.
- D. "Materials": Products substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form units of work.
- E. "Equipment": Product with operational parts, regardless of whether motorized or manually operated, and in particular, product that requires service connections such as wiring or piping.
- F. Standards: Refer to Division-1 section "Definitions and Standards" for applicability of industry standards to products specified for Project, and for acronyms used in text of specification sections.

1.04 QUALITY ASSURANCE

- A. Source Limitations: To fullest extent possible, provide products of same generic kind, from single source, for each unit of work.
 - 1. When discovered that specified products available only from sources that do not or cannot produce adequate quantity to complete project requirements in timely manner, consult Architect for determination of what product qualities are most important before proceeding.
 - a. Architect will designate those qualities, such as visual, structural, durability, or compatibility, that are most important.
 - b. When Architect's determination made, select products from those sources that produce products that possess most important qualities, to fullest extent possible.
- B. Compatibility of Options:
 - 1. Compatibility of products is basic requirement of product selection.
 - 2. When Contractor given option of selecting between two or more products for use on project, product selected must be compatible with other products previously selected, even if products previously selected were also Contractor options.
 - 3. Complete compatibility between various choices available to Contractor not assured by various requirements of Contract Documents, but must be provided by Contractor.
- C. Foreign Product Limitations:
 - 1. "Foreign products" as distinguished from "domestic products" defined as products either manufactured substantially (50% or more of value) outside the United States and its possessions, or produced or supplied by entities known substantially owned (more than 50%) by persons not citizens of, nor living within the United States and its possessions.
 - 2. Except under one or more of following conditions, select and provide domestic, not foreign products for inclusion of Work:
 - a. No domestic product available complying with requirements of Contract Documents.
 - b. Available domestic products complying with requirements of Contract Documents available only at prices or other procurement terms substantially higher (25 percent or more) than for available foreign products complying with requirements of Contract Documents.

1.05 SUBMITTALS

- A. Product Listing Submittal:
 - 1. General:
 - a. Prepare product-listing schedule in form acceptable to Architect.
 - 1) Show names of principal products required for work, by generic name.
 - 2) Show proprietary product names and name of manufacturer for each item listed to be purchased and incorporated into Work.
 - 2. Form:
 - a. Prepare product-listing schedule with information on each item tabulated under following scheduled column headings:
 - 1) Generic name as used in Contract Documents.
 - 2) Proprietary name, model number and similar product designation.
 - 3) Manufacturer's and supplier's name and city/state addresses.
 - 4) Related unit-of-work specification section number.
 - 5) Installer's name and primary trade of workmen.
 - 6) Projected delivery date, or time span of delivery period.
 - 3. Submittal:
 - a. Submit 3 copies of product-listing schedule within 30 days after date of commencement of Work.
 - b. Provide written explanation for omissions of data, and for known variations from contract requirements.
 - c. At the Contractor's option, initial submittal of product-listing schedule may be limited to product selections and product designations to be established early in Contract Time.
 - 1) Submit completed product-listing schedule within 60 days after commencement of Work.

4. Architect's Action:
 - a. Architect will respond to Contractor in writing within 2 weeks of receipt of product-listing schedule.
 - b. No response by Architect within 2 week time period constitutes no objection to listed products or manufacturers, but does not constitute waiver of requirement that products comply with requirements of Contract Documents.
 - c. Architect's response will include following:
 - 1) The Architect's listing of unacceptable product selection, if any, containing explanation of reasons for action.
 - 2) Request for additional data necessary for review and possible acceptance of products and manufacturer's listed.
 - B. Substitution Request Submittal:
 1. Requests for Substitutions:
 - a. Submit 3 copies of each request for substitution using form included at end of this section.
 - b. In each request identify product or fabrication or installation method replaced by substitution; include related specification section and drawing numbers, and complete documentation showing compliance with requirements for substitutions.
 - c. Include following information, as appropriate, with each request.
 - 1) Provide complete product data, drawings and descriptions of products, and fabrication and installation procedures.
 - 2) Provide samples where applicable or requested.
 - 3) Provide detailed comparison of significant qualities of proposed substitution with those of work originally specified; significant qualities include elements such as size, weight, durability, performance and visual effect where applicable.
 - 4) Provide complete coordination information; include all changes required in other elements of work to accommodate substitution, including work performed by Owner and separate Contractors.
 - 5) Provide statement indicating effect substitution has on work schedule in comparison to schedule without approval of proposed substitution; include information regarding effect of proposed substitution on Contract Time.
 - 6) Provide complete cost information, including proposal of net change, if any in Contract Sum.
 - 7) Provide certification by Contractor to effect that, in Contractor's option, after thorough evaluation, proposed substitution results in work that in every significant respect is equal-to or better than work required by Contract Documents, and it will perform adequately in application indicated.
 - 8) Include in certification, Contractor's waiver of rights to additional payment or time, which may be necessary because of failure of substitution to perform adequately.
 2. Change Order Form:
 - a. Submit requests for substitutions in form and in accordance with procedures required for change order proposals.
 3. Architect's Action:
 - a. Within one week of receipt of Contractor's request for substitution, Architect will request additional information or documentation as needed for evaluation of request.
 - b. Within 2 weeks of receipt of request, or within one week of receipt of requested additional information or documentation, which ever is later, Architect will notify Contractor of either acceptance or rejection of proposed substitution.
 - c. Acceptance will be in form of change order.
 - d. Rejection will include statement giving reasons for rejection.
- 1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING
- A. General: Deliver, store, and handle products in accordance with manufacturer's recommendations, using means and methods to prevent damage, deterioration and loss, including theft.
 1. Control to prevent overcrowding of construction spaces.
 2. In particular coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other sources of loss.
 - B. Deliver products to site in manufacturer's sealed container or other packaging system, complete with labels and instructions for handling, storage, unpacking, protecting and installing.

- C. Store products at site in manner to facilitate inspection and measurement of quantity or counting of units.
- D. Store heavy materials away from project structure in manner to not endanger supporting construction.

1.07 WARRANTIES (GUARANTEES)

- A. Categories of Specific Warranties:
 - 1. Warranties on work are in several categories, including those of General Conditions, and including (but not necessarily limited to) following specific categories related to individual units of work specified in sections of Divisions 2 through 16 of specifications:
 - 2. Special Project Warranty (Guarantee): Warranty specifically written and signed by Contractor for defined portion of Work; and, where required, countersigned by subcontractor, installer, manufacturer or other entity engaged by Contractor.
 - 3. Specified Product Warranty: Warranty required by Contract Documents, provided for manufactured product incorporated into Work; regardless of whether manufacturer published similar warranty without regard for specific incorporation of product into Work, or has written and executed special product warranty as direct result of Contract Document requirements.
 - 4. Coincidental Product Warranty: Warranty not specifically required by Contract Documents (other than as specified in this Section); but which is available on product incorporated into Work, by virtue of fact that manufacturer of product published warranty in connection with purchases and uses of product without regard for specific applications except as otherwise limited by terms of warranty.
- B. Refer to individual sections of Divisions 2 through 16 for determination of units of work required to be specifically or individually warranted, and for specific requirements and terms of warranties (or guarantees).
- C. General Limitations: It is recognized that specific warranties intended primarily to protect Owner against failure of Work to perform as required, and against deficient, defective and faulty materials and workmanship, regardless of sources.
 - 1. Except as otherwise indicated, specific warranties do not cover failures in Work which result from:
 - a. Unusual and abnormal phenomena of elements.
 - b. Owner's misuse, maltreatment of improver maintenance of Work.
 - c. Vandalism after time of Final Acceptance.
 - d. Insurrection or acts of aggression including war.
- D. Related Damages and Losses:
 - 1. In connection with Contractor's correction of failed warranted work, remove and replace other work of Project damaged as result of such failure, or must be removed and replaced to provide access or correction of warranted work.
 - 2. Consequential Damages: Except as otherwise indicated or required by governing regulations, special project warranties and product warranties are not extended to cover damage to building contents (other than work of Contract) which occurs as result of failure of warranted work.
- E. Warranty Periods:
 - 1. All warranties begin on date of **FINAL ACCEPTANCE** for specified period of time from that date.
 - 2. No warranty period less than one year.
- F. Reinstatement of Warranty Period: Except as otherwise indicated, when work covered by special project warranty or product warranty failed and was corrected by replacement or restoration, reinstate warranty by written endorsement for following time period, starting on date of acceptance of replaced or restore work.
 - 1. Period of time equal to original warranty period of time.
- G. Replacement Cost, Obligations: Except as otherwise indicated, costs of replacing or restoring failing warranted units or products is Contractor's obligation, without regard for whether Owner has benefitted from use through portion of anticipated useful service lives.
- H. Rejection of Warranties: Owner reserves right, at time of Final Acceptance or thereafter, to reject coincidental product warranties submitted by Contractor, which in opinion of Owner tend to detract from or confuse interpretation of requirements of Contract Documents.

- I. Contractor's Procurement Obligations: Do not purchase, subcontract for, or allow others to purchase or sub-subcontract for materials or units or work for Project where special project warranty, specified product warranty, certification or similar commitment required, until determined that entities required to countersign such commitments are willing to do so.
- J. Specific Warranty Forms: Where special project warranty (guarantee) or specified product warranty required, prepare written document to contain terms and appropriate identification, ready for execution by required parties.
 - 1. Submit draft to Owner (through Architect) for approval prior to final executions.

PART 2 - PRODUCTS

2.01 GENERAL PRODUCT COMPLIANCE

- A. General:
 - 1. Requirements for individual products indicated in Contract Documents; compliance with these requirements is in itself a contract requirement.
 - 2. These requirements may be specified in any one of several different specifying methods, or in any combination of these methods.
 - 3. These methods include following:
 - a. Proprietary.
 - b. Descriptive.
 - c. Performance.
 - d. Compliance with Reference Standards.
 - 4. Compliance with codes, compliance with graphic details, allowances, and similar provisions of Contract Documents also have a bearing on selection process.
- B. Procedures for Selecting Products:
 - 1. Contractor's options in selecting products limited by requirements of Contract Documents and governing regulations.
 - 2. Options not controlled by industry traditions or procedures experienced by Contractor on previous construction projects.
 - 3. Required procedures include but not limited to following for various indicated methods of specifying:
 - a. Proprietary and Semi-proprietary Specification Requirements:
 - 1) Single Product Name: Where only single product or manufacturer named, provide product indicated, unless specification indicates possible consideration of other products.
 - a) Advise Architect before proceeding, when discovering that named product not reasonable or feasible solution.
 - 2) Two or More Product Names:
 - a) Where two or more products or manufacturers named, provide one of products named, at Contractor's option.
 - b) Exclude products that do not comply with specification requirements.
 - c) Do not provide or offer to provide unnamed product, unless specification indicates possible consideration of other products.
 - d) Advise Architect before proceeding where none of named products comply with specification requirements or are feasible for use.
 - 3) Where products or manufacturers specified by name, accompanied by term "or-equal" or similar language, comply with Contract Document provisions concerning "substitutions" to obtain approval from Architect for use of unnamed product.
 - a) Products approved under the "Or-Equal" provision only approved during bidding period; refer to Section 01630.
 - b. Non-Proprietary Specification Requirements: Where specifications name products or manufacturers available and may be incorporated in Work, but do not restrict Contractor to use of these products only, Contractor may, at his option, use any available product that complies with contract requirements.

- c. Descriptive Specification Requirements:
 - 1) Where specifications describe product or assembly generically, in detail, listing exact characteristics required, but without use of brand or trade name, provide products or assemblies that provide characteristics indicated and otherwise comply with contract requirements.
 - d. Performance Specification Requirements:
 - 1) Where specifications require compliance with indicated performance requirements, provide products that comply with specific performance requirements indicated, and recommended by manufacturer for application indicated.
 - a) Manufacturer's recommendations may be contained in published product literature, or by manufacturer's individual certification of performance.
 - b) General overall performance of product implied where product specified for specific performances.
 - e. Compliance with Standards, Codes, and Regulations:
 - 1) Where specifications require only compliance with imposed standard, code or regulation, Contractor has option of selecting product that complies with specification requirements, including standards, codes, and regulations.
- C. Visual Matching:
- 1. Where matching established sample required, final judgment of whether product proposed by Contractor matches sample satisfactorily determined by Architect.
 - 2. Where no product available within specified product category that matches sample satisfactorily and also complies with other specified requirements, comply with provisions of Contract Documents concerning "substitutions" and "change orders" for selection of a matching product in another product category, or for non-compliance with specified requirements.
- D. Visual Selection:
- 1. Except as otherwise indicated, where specified product requirements include phrase "...as selected from manufacturer's standard colors, patterns, textures..." or similar phrases, Contractor has option of selecting product and manufacturer, provided selection complies with other specified requirements.
 - 2. Architect subsequently responsible for selecting color, pattern and texture from product line selected by Contractor.
- E. Producer's Statement of Applicability:
- 1. Where individual specification sections indicate products that require "Statement of Applicability" from manufacturer or other producer, submit written-certified statement from producer stating that producer reviewed proposed application of product on Project.
 - 2. Statement state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 3. Statement also state that proposed application of product on project is suitable and proper.

2.02 SUBSTITUTIONS

- A. Conditions: Contractor's request for substitution received and considered when extensive revisions to Contract Documents not required, when proposed changes in keeping with general intent of Contract Documents, when requests are timely, fully documented and properly submitted, and when one or more of following conditions satisfied, all as judged by Architect; otherwise requests returned without action except to record non-compliance with requirements.
- 1. Architect will consider request for substitution where:
 - a. Specified product or method cannot be provided within Contract Time; however, request not considered if product or method cannot be provided as result of Contractor's failure to pursue work promptly or coordinate various activities properly.
 - b. Specified product or method cannot receive necessary approval by governing authority, and requested substitution can be approved.
 - c. Substantial advantage offered Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting of offsetting responsibilities Owner may be required to bear; these additional responsibilities may include such considerations as additional compensation to Architect for redesign and evaluation services, increased cost of other work by Owner or separate contractors, and similar considerations.

- d. Specified product or method cannot be provided in manner compatible with other materials of Work, and where Contractor certifies that substitution will overcome incompatibility.
 - e. Specified product or method cannot be properly coordinated with other materials in Work, and where Contractor certifies that proposed substitution can be properly coordinated.
 - f. Specified product or method cannot receive warranty required by Contract Documents and where Contractor certifies that proposed substitution receive required warranty.
- B. Work-Related Submittals: Contractor's submittal of and Architect's acceptance of shop drawings, product data or samples which relate to work not complying with requirements of Contract Documents, does not constitute acceptable or valid request for substitution, nor approval thereof.

2.03 GENERAL PRODUCT REQUIREMENTS

- A. General: Provide products that comply with requirements of Contract Documents undamaged and, unless otherwise indicated, unused at time of installation.
 - 1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for complete installation and for intended use and effect.
- B. Standard Products: Where available, provide standard products of types produced and used successfully in similar situations on other projects.
- C. Continued Availability: Where, because of nature of application, Owner is likely to need replacement parts or additional amounts of product at later date, either for maintenance and repair or replacement, provide standard, domestically produced products for which manufacturer has published assurances that products and parts will be available to Owner at later date.
- D. Nameplates: Except as otherwise indicated for required labels and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on exterior of completed project.
- E. Labels: Locate required product labels and stamps on concealed surface or, where required for observation after installation, on accessible surface which, in occupied spaces, is not conspicuous.
- F. Equipment Nameplates:
 - 1. Provide permanent nameplate on each item of service-connected or power-operated equipment.
 - 2. Locate nameplate on easily accessible surface, inconspicuous in occupied spaces.
 - 3. Nameplate to contain following information and other essential operating data.
 - a. Name of manufacturer
 - b. Name of product
 - c. Model number
 - d. Serial number
 - e. Capacity
 - f. Speed
 - g. Ratings

PART 3 - EXECUTION

3.01 INSTALLATION OF PRODUCTS

- A. General:
 - 1. Except as otherwise indicated in individual sections of specifications, comply with manufacturer's instructions and recommendations for installation of products in applications indicated.
 - 2. Anchor each product securely in place, accurately located and aligned with other work.
 - 3. Clean exposed surfaces and protect surfaces as necessary to ensure freedom from damage and deterioration at time of acceptance.

END OF SECTION 01 6310

SUBSTITUTION REQUEST FORM

TO: _____

PROJECT: _____

We hereby submit for your consideration following product instead of specified item for above project:

<u>DRAWING</u>	<u>SPEC. SECT. NO</u>	<u>PARAGRAPH</u>	<u>SPECIFIED ITEM</u>
_____	_____	_____	_____

Proposed Substitution: _____

(NOTE: Attach complete information on changes to Drawings and/or Specifications which proposed substitution will require for proper installation. Submit, with request, all necessary samples and substantiating data to prove equal quality and performance to that specified. Clearly mark manufacturer's literature to indicate equality in performance.)

Fill in Blanks Below:

A. Does substitution affect dimensions shown on the Drawings? Yes _____ No _____

If yes, clearly indicate changes. _____

B. Will undersigned pay for changes to building design, including engineering and detailing costs caused by requested substitution? Yes _____ No _____

If no, fully explain: _____

C. What effect does substitution have on other Contracts or other Trades?

D. What effect does substitution have on construction schedule? _____

E. Manufacturer's warranties of proposed and specified items are:

Same _____ Different _____ (explain on attachm ent).

F. Reason for request: _____

- G. Itemized comparison of specified item(s) with the proposed substitution;
 list significant variations: _____

- H. Accurate cost data comparing proposed substitution with product specified:

- I. Designation of maintenance services and sources: _____

(Attach additional sheets if required.)

**CERTIFICATION OF EQUAL PERFORMANCE
 AND ASSUMPTION OF LIABILITY FOR
 EQUAL PERFORMANCE**

For Use By Architect:

Accepted Accepted as Noted
 Not Accepted Received Too Late

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

Submitted By:

Signature	Title	By
Firm		Date
Address		Remarks
Telephone	Date	

Signature shall be by person having authority to legally bind his firm to the above terms. Failure to provide legally binding signature will result in rejection of proposed substitution

**SECTION 01 7320
CUTTING AND PATCHING**

PART 1 - GENERAL

1.01 SUMMARY

- A. Definitions:
 - 1. Cutting and Patching: Cutting into existing or new construction for installation, performance of other work, subsequent fitting, and patching to restore surface to original condition. Work performed for following activities considered to be cutting and patching:
 - a. Removal of new work where not in compliance with requirements of specifications.
 - b. Coordination of work.
 - c. Uncovering work for access and/or inspection.
 - d. Obtaining samples for inspection.
 - e. Permitting alterations to be performed.
 - f. Other similar purposes.
 - 2. Not Cutting and Patching: The following activities not considered to be cutting and patching activities when performed during:
 - a. Manufacturing of products.
 - b. Initial fabrication.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this Section.
- B. Refer to other sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.
- C. Unless otherwise specified, requirements of this Section apply to mechanical and electrical work; refer to Division-15 and Division-16 sections for additional requirements and limitations on cutting and patching of mechanical and electrical work.

1.03 QUALITY ASSURANCE

- A. Requirements for Structural Work:
 - 1. Do not cut and patch structural work in manner resulting in reduction of load-carrying capacity or of load-deflection ratio.
 - 2. When in doubt, notify Architect.
- B. Operational and Safety Limitations:
 - 1. Do not cut and patch operational elements or safety related components in manner resulting in reduction of their capacity to perform in manner intended, including energy performance, or resulting in increased maintenance, or decreased operational life or decreased safety.
 - 2. Before cutting and patching following elements of work, and similar work elements where directed, obtain Architect's approval to proceed with cutting and patching proposed in proposal for cutting and patching.
 - a. Shoring, bracing, and sheeting.
 - b. Primary operational systems and equipment.
 - c. Water/moisture/vapor/air/smoke barriers, membranes and flashings.
 - d. Noise and vibration control elements and systems.
 - e. Control, communication, conveying, and electrical wiring systems.
 - f. Special construction, as specified by Division-13 sections.
- C. Visual Requirements:
 - 1. Do not cut and patch work exposed on building's exterior or in occupied spaces, in manner that would, in Architect's opinion, result in lessening building's aesthetic qualities.

2. Do not cut and patch work in manner resulting in substantial visual evidence of cut and patch work.
3. Remove and replace work judged by Architect to be cut and patched in visually unsatisfactory manner.
4. If possible retain original installer or fabricator, or another recognized experienced and specialized firm to cut and patch following categories of exposed work.
 - a. Roofing.
 - b. Preformed metal panels.
 - c. Acoustical ceilings.
 - d. Terrazzo
 - e. Finish wood flooring
 - f. Carpeting.
 - g. Wall covering.
 - h. HVAC enclosures, cabinets or covers.

1.04 SUBMITTALS

- A. Procedural Proposal for Cutting and Patching:
 1. Where prior approval of cutting and patching required, submit proposed procedures well in advance of time work to be performed and request approval to proceed.
 2. Include following information, as applicable, in submittal:
 - a. Describe nature of work and how it is to be performed, indicating why cutting and patching cannot be avoided.
 - b. Describe anticipated results of work in terms of changes to existing work, including structural, operational and visual changes as well as other significant elements.
 - c. List products to be used and firms to perform work.
 - d. Give dates when work expected to be performed.
 - e. List utilities that disturbed or otherwise affected by work, including those to be relocated and those to be out-of-service temporarily; indicate how long utility service to be disrupted.
 - f. Where cutting and patching of structural work involves addition of reinforcement, submit details and engineering calculations to show how reinforcement integrated with original structure to satisfy requirements.
- B. Approval by Architect to proceed with cutting and patching work does not waive Architect's right to later require complete removal and replacement of work found cut and patched in unsatisfactory manner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General:
 1. Except as otherwise indicated, or as directed by Architect, use materials for cutting and patching identical to existing materials.
 2. If identical materials not available, or cannot be used, use materials that match existing adjacent surfaces to fullest extent possible with regard to visual effect.
 3. Use materials for cutting and patching resulting in equal-or-better performance characteristics

PART 3 - EXECUTION

3.01 INSPECTION

- A. Before cutting, examine surfaces to be cut and patched and conditions under which work to be performed.
 1. If unsafe or otherwise unsatisfactory conditions encountered, take corrective action before proceeding with work.
- B. Before start of cutting work, meet at jobsite with all parties involved in cutting and patching, including mechanical and electrical trades.
 1. Review areas of potential interference and conflict between various trades.

2. Coordinate layout of work and resolve potential conflicts before proceeding with work.

3.02 PREPARATION

- A. Temporary Support: To prevent failure provide temporary support of work to be cut.
- B. Protection: Protect other work during cutting and patching to prevent damage.
 1. Provide protection from adverse weather conditions for that part of Project exposed during cutting and patching operations.
 2. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
 3. Take precautions not to cut existing pipe, conduit or duct serving building but scheduled to be relocated until provisions made to bypass them.

3.03 PERFORMANCE

- A. General:
 1. Employ skilled workmen to perform cutting and patching work.
 2. Except as otherwise indicated or approved by Architect, proceed with cutting and patching at earliest feasible time and complete work without delay.
- B. Cutting:
 1. Cut work using methods least likely to damage work to be retained or adjoining work.
 2. Where possible review proposed procedures with original installer; comply with original installer's recommendations.
 3. In general, where cutting required use hand or small power tools designed for sawing or grinding, not hammering and chopping.
 4. Cut through concrete and masonry using cutting machine such as carborundum saw or core drill to insure neat hole.
 5. Cut holes and slots neatly to size required with min. disturbance of adjacent work.
 6. To avoid marring existing finished surfaces, cut or drill from exposed or finished side into concealed surfaces.
 7. Temporarily cover openings when not in use.
 8. Comply with requirements of applicable sections of Division 2 where cutting and patching requires excavating and backfilling.
 9. By-pass utility services such as pipe and conduit, before cutting, where such utility services shown or required to be removed, relocated or abandoned.
 - a. Cut-off conduit and pipe in walls or partitions to be removed.
 - b. After by-pass and cutting, cap, valve or plug and seal tight remaining portion of pipe and conduit to prevent entrance of moisture or other foreign matter.
- C. Patching:
 1. Patch with seams durable and invisible as possible.
 2. Comply with specified tolerances for the work.
 3. Where feasible, inspect and test patched areas to demonstrate integrity of work.
 4. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work in manner which eliminates evidence of patching and refinishing.
 5. Where removal of walls or partitions extends one finished area into another finished area, patch and repair floor and wall surfaces in new space to provide even surface of uniform color and appearance.
 6. Patch, repair or rehang existing ceilings as necessary to provide even plane surface of uniform appearance.
- D. Touch Up Painting:
 1. Where patch occurs in smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area receives prime and base coat.
 - a. Areas to be patched shall receive the same number of coats of paint as the area adjacent to area being patched.
 - b. 'Spot' touch of painted surfaces not acceptable.
 - c. Finished surface of areas being patched to match, in color, sheen, texture and general appearance of adjacent, non-patched areas.

2. If necessary to achieve uniform color and appearance, remove existing floor and wall coverings and replace with new materials.

3.04 CLEANING

- A. Thoroughly clean areas and spaces where work performed or used as access to work.
 1. Remove completely paint, mortar, oils, putty and items of similar nature.
 2. Thoroughly clean piping, conduit and similar features before painting or other finishing applied.
 3. Restore damaged pipe covering to original condition.

END OF SECTION 01 7320

**SECTION 01 7700
CLOSEOUT PROCEDURES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this Section.
- B. Specific requirements for individual units of work included in appropriate sections in Divisions 2 through 33.

1.02 DEFINITIONS:

- A. Definitions: Project closeout is term used to describe certain collective project requirements, indicating completion of Work that are fulfilled near end of Contract time in preparation for final acceptance and occupancy of Work by Owner, as well as final payment to Contractor and normal termination of Contract.
- B. Substantial Completion: The date of Substantial Completion of the work or designated portion thereof is the Date certified by the Architect when the construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy and utilize the work or designated portion thereof for the use for which it is intended, as expressed in the contract documents.

1.03 DAMAGES FOR FAILURE TO CLOSE OUT PROJECT:

- A. Time of closeout directly related to "Final Acceptance":
 - 1. Time of closeout may be either single time period for entire Work or series of time periods for individual elements of Work certified substantially complete at different dates.
 - 2. The date of the substantial completion shall be on or before the date established within the Owner/contractor contract and as modified in executed change orders.
- B. Notices to Contractor and Bonding Company: Approximately ninety (90) days after the date of the date of the notice of substantial completion the Owner and/or Architect will, should the project closeout remain incomplete, issue to the contractor and the contractor's bonding company a notice indicating that, should the project closeout not be completed within thirty days, liquidated damages shall be applied to the project as indicated herein.
- C. Nothing herein is intended to limit the right of the Owner to terminate the Contractor or any other rights and remedies available to the Owner not inconsistent herewith.
- D. If, in the opinion of the Owner and Architect, it is evident that the Contractor is unwilling or unable to bring the project to a close within the allotted time frame, and upon the issuance of two, 48 hour notices, the Owner may then complete all unfinished work and/or assign a value to any incomplete work and any unfurnished documentation. The final application for payment will be adjusted accordingly.

1.04 INSPECTIONS

- A. General: Contractors are reminded that it is the responsibility of the contractor(s) to install the work in full compliance with the contract documents. It is not the responsibility of the Owner, Architect and/or Consultants to discover incorrect, incomplete, or omitted work. The performance of inspections by the Architect and/or consultants shall in no way relieve the contractor of his requirements of complying fully with the contract documents.
- B. Contractor's Work List: Prior to requesting the Architect perform pre-final and final inspections the contractor shall conduct a detailed inspection of the building and develop a work list of items remaining to be completed and or corrected.
 - 1. Upon completion of "work-list" items contractor shall certify to the Architect that work is 100% completed.

- C. Inspection Procedures: Upon receipt of Contractor's written request for inspection, Architect and/or Consultants will conduct a "Pre-Final" visit. Results of completed inspection will form initial "punch-list" for final acceptance.
- D. Reinspection Procedure: Architect will reinspect Work upon receipt of Contractor's notice that Work, including punch-list items resulting from earlier inspections, completed, except for items whose completion delayed because of circumstances acceptable to Architect.
 - 1. As part of the request for re-inspection, the contractor shall submit to the architect, a copy of all previous punch lists with the project superintendent's or project manager's signature placed by each item attesting to the fact that the contractor has personally viewed each item and verified that the work has been completed. No re-inspections will be performed by the architect until the contractor certifies that work previously identified on the punch has been corrected.
 - 2. Upon completion of reinspection, Architect will either prepare certificate of final acceptance, or will advise Contractor of incomplete work or of obligations not fulfilled, but required for final acceptance. Results of reinspection will form revised "punch list" for final acceptance.
 - 3. If necessary, the reinspection procedure will be repeated.
- E. Contractor's Certification: Submit certified copy of Architect's initial and revised punch-list of itemized work to be completed or corrected, stating that each item completed or otherwise resolved for acceptance and endorsed and dated by Architect; list known exceptions in request.
- F. False Start Inspections: Should contractor request any inspections for which he is not ready the contractor shall be liable for costs incurred by Architect and/or Consultants in the performance of the requested inspections in accordance with the provisions of Article E-13 of the General Conditions of the specifications.
 - 1. Reinspection by the Architect and/or consultants will not be performed until such time as payment for "false start" visits received by Architect.

1.05 PREREQUISITES TO FINAL ACCEPTANCE

- A. General: Complete following before requesting Architect's inspection for certification of Final Acceptance, either for entire Work or for portions of Work.
 - 1. Submit certified copy of Architect's final punch-list of itemized work to be completed or corrected, stating that each item completed or otherwise resolved for acceptance and endorsed and dated by Architect; list known exceptions in request.
 - 2. Submit to the Owner the original and to the architect a copy of each of the following occupancy permits:
 - a. Fire Marshall's Occupancy Permit
 - b. Building Inspection Department Occupancy Permit.
 - 3. Certification from Contractor stating that all materials, products and assemblies incorporated into the work of this project are 100% free from asbestos, Lead, PCB's or other hazardous materials.
- B. In progress payment request that coincides with, or if first request following, date Final Acceptance claimed, show either 100% completion for portion of Work claimed as complete, or list incomplete items, value of incomplete work, and reasons for Work being incomplete.
 - 1. Include supporting documentation for completion as indicated in these Contract Documents.
 - 2. Advise Owner of pending insurance change-over requirements.
 - a. Include certificates of insurance for products and completed operations where required.
 - b. Evidence of final, continuing insurance coverage complying with insurance requirements.
 - 3. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
 - 4. Obtain and submit releases enabling Owner's full, unrestricted use of Work and access to services and utilities.
 - a. Where required, include occupancy permits, operating certificates and similar releases.
 - b. Submit consent of surety.
 - 5. Deliver tools, spare parts, extra stocks of material and similar physical items to Owner.
 - 6. Make final change-over of locks and transmit keys (General Conditions, Article E-54) to Owner; advise Owner's personnel of change-over in security provisions.
 - 7. Complete start-up testing of systems, and instruction of Owner's operating and maintenance personnel.

8. Discontinue or change over and remove temporary facilities and services from project site, along with construction tools and facilities, mock-ups, and similar elements.
 9. Complete final cleaning up requirements, including touch-up painting of marred surfaces.
 10. Touch-up and otherwise repair and restore marred exposed finishes.
- C. Final Submittals: Submit following documents:
1. List of all major suppliers and sub-contractors, including firm name, address, telephone number, and contact person, for each major supplier and sub-contractor.
 2. Final payment request with final releases and supporting documentation not previously submitted and accepted and final statement, accounting for changes to Contract Sum.
 3. Consent of Surety to Close-Out Project and issue final payment.
 4. Non-Influence Affidavit (General Conditions, Article E-28).
 5. Statutory Affidavit (General Conditions, Article E-28).
 6. Copy of Fire Marshall's Occupancy Permit.
 7. Notice of Readiness for Final Inspection (General Conditions, Article E-41).
 8. Operation and Maintenance Data and Instructions General Conditions, Article E-55).
 9. Certificates of Manufacturers for Major Components (General Conditions, Article E-67).
 10. Certification of installation and proper operation of Fire Alarm System.
 11. Testing and Balancing of Air Distribution Systems.
 12. Record Documents (General Conditions, Article E-6 and Supplementary General Conditions, Article 1 and Article in this Section below).
 13. Certification of installation and proper operation finish hardware (Section 08 7100 - Finish Hardware).
 14. Inspection reports of regulatory agencies (Section 01 4100 - Regulatory Requirements).
 15. Certification from all individual manufacturers of materials known to contain asbestos or in the past known to contain asbestos, that their products used on Project do not contain asbestos.
 16. Soil Treatment Guarantee (Section 31 3116 - Termite Control).
 17. List of extra materials (attic) stock transmitted to Owner. List to include type of material, quantity of materials, date of delivery, and location of delivery. Contractor to have Owner sign list verifying receipt of materials noted.
 18. Supporting documentation showing that required training and instruction in use of building systems have been performed. Documentation to include date of training, agenda used for training, parties present, video recording session.
 19. Final meter readings for utilities, measured record of stored fuel, and similar data as of date of Final Acceptance, or else when Owner took possession of and responsibility for corresponding elements of Work.
 20. Specified Warranties.
 21. Other Documents specified herein.
 22. Similar final record information.
- D. Include all above items in loose-leaf, notebook type binder in same order as listed above and tabbed accordingly.
1. Provide type-written statement stating disposition of items not included in binder because of physical limitations.
 2. Submit items not listed above, but required by other Sections of Project Manual, at completion of job, and include in binder, numbered consecutively by Specifications Section.
- E. Submit all closeout documents at one time; partial submittals returned for completion and correction.
1. Submit three (3) complete copies of all required closeout documents.
- F. Delivery of Closeout Documents: Submit close out documents in accordance with the following:
1. Complete closeout documents, including as-built survey, to be submitted a minimum of thirty days prior to request for final inspection or building occupancy, which ever occurs first.

1.06 RECORD DOCUMENT SUBMITTALS

- A. General:
1. Specific requirements for record documents indicated in individual sections of these specifications.
 2. Other requirements indicated in General Conditions.
 3. General submittal requirements indicated in "submittals" sections.
 4. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.
- B. Record Drawings:
1. Maintain record set of blue or black line white-prints of contract drawings and shop drawings in clean, undamaged condition.
 2. Mark-up set of record documents to show actual installation where installed work varies from conditions shown on contract documents.
 3. Indicate location of underground utilities by vertical dimensions (depth) and horizontal dimension from fixed permanent reference points (Minimum of two points).
 4. Mark whichever drawing most capable of showing actual "field" condition fully and accurately; however, where shop drawings used for mark-up, record cross-reference at corresponding location on working drawings.
 5. Give particular attention to concealed work that would be difficult to measure and record at later date.
 6. Mark record sets with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work. Use green erasable pencil to document items revised by change order.
 7. Mark-up new information known to be important to Owner, but for some reason was not shown on either contract drawings or shop drawings.
 8. Show, on appropriate place on drawings, addendum, post-bid addendum, and change orders which affect the contract. Note related addendum, post-bid addendum, and change-order number where applicable.
 9. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on cover of each set.
- C. Preparation of Transparencies:
1. In preparation for certification of Final Acceptance on last major portion of work, review completed markup of record drawings with Architect.
 2. When authorized, proceed with preparation of full set of corrected transparencies for contract drawings and shop drawings.
 3. Incorporate changes and additional information previously marked-up on print sets, by erasing and redrawing where applicable, and by adding details and notations where applicable; refer instances of uncertainty to Architect for determination.
 4. Identify and date each updated drawing.
 5. Printing of original drawings to produce transparencies and other prints as required herein is Contractor's responsibility; Architect will make original contract drawings available to Contractor's print shop.
- D. Copies, Distribution:
1. Upon completion of record drawings, prepare 3 blueline or blackline prints of each drawing, with changes and additional information recorded thereon.
 2. Organize each of 3 copies into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on cover of each set.
 3. Organize and bind mark-up set of prints (maintained during construction period) in same manner.
 4. Organize transparencies into sets matching print sets, place set in durable tube-type drawing container (with end caps), and mark end cap of each with suitable identification.
 5. Submit records (Architect will retain one copy set).

6. Review of Transparencies:
 - a. Prior to copying and distributing, submit corrected transparencies and mark-up prints to Architect for review and acceptance.
 - b. When acceptable, Architect will initial and date each transparency, indicating acceptance of general scope of changes and additional information recorded thereon, and of general quality of draftsmanship thereon (erasures and drafting).
 - c. Transparencies and mark-up prints will be returned to Contractor for organizing into sets, printing, binding, and final submittal.

- E. Record Specifications:
 1. Maintain one complete copy of Project Manual, including specifications and addenda, and one copy of other written construction documents such as change orders and similar modifications issued in printed form during construction.
 2. Mark these documents to show substantial variations in actual work performed in comparison with text of specifications and modifications as issued.
 3. Give particular attention to substitutions, selection of options and similar information on work where it is concealed or cannot otherwise be readily discerned at later date by direct observation.
 4. Note related record drawing information and product data, where applicable.
 5. Immediately prior to date or dates of Final Acceptance, complete record product data and place in good order, properly identified and bound or filed, ready for continued use and reference.

- F. Record Product Data:
 1. Maintain one copy of each product data submittal.
 2. Mark documents to show significant variations in actual Work performed in comparison with submitted information.
 3. Include both variations in products as delivered to site, and variations from manufacturer's instructions and recommendations for installation.
 4. Give particular attention to concealed products and portions of Work not otherwise readily discerned at later date by direct observation.
 5. Note related change orders and mark-up of record drawings and specifications.
 6. Upon Completion of mark-up, submit complete set of record product data to Architect for Owner's records.

- G. Record Sample Submittal:
 1. Immediately prior to date or dates of Final Acceptance, Contractor meet at site with Architect and Owner's personnel, if desired, to determine which, if any, of submitted samples maintained by Contractor during progress of Work, to be transmitted to Owner for record purposes.
 2. Comply with delivery to the Owner's sample storage space.

- H. Miscellaneous Record Submittals:
 1. Refer to other sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with actual performance of Work.
 2. Immediately prior to date or dates of Final Acceptance, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference.
 3. Submit to Architect for Owner's records.

- I. Maintenance Manuals:
 1. Organize operating and maintenance data into suitable sets of manageable size.
 2. Bind data into individual binders properly identified and indexed.
 3. Bind each set of data in heavy-duty 2-inch, 3-ring vinyl-covered binder, with pocket folders for folded sheet information.
 4. Mark appropriate identification on both front and spine of each binder.
 5. Include following types of information in operation and maintenance manuals:
 - a. Emergency instructions.
 - b. Spare parts listing.
 - c. Copies of warranties.
 - d. Wiring diagrams.

- e. Recommended "turn-around" cycles.
- f. Inspection procedures.
- g. Shop drawings and product data.

1.07 WARRANTY INSPECTION

- A. General: As part of the contract provisions the contractor, sub contractors, suppliers and vendors are required to warrant products and installations to be free of defects for no less than twelve (12) months from the date of substantial completion of the work.
 - 1. Refer to general conditions to the contract for additional requirements related to the contractor's obligations for the correction of work after final payment, including work covered by the one year warranty.
 - 2. Products and installation found to be defective during the warranty period shall be repaired or replaced promptly by the contractor.
- B. Nine Month Inspection: Approximately nine months after the date of substantial completion of the work, a detailed inspection of the building will be performed to determine the contractor's responsibilities for the correction of non-conforming and/or defective work.
- C. Participants: The nine month inspection of the building shall be conducted by all major parties to the contract, including, as a minimum the following:
 - 1. General Contractor, project manager and superintendent
 - 2. All major subcontractors, including site, utilities, flooring, metal roofing, modified bitumen roofing, plumbing, mechanical and electrical sub contractors.
- D. Documentation of Deficiencies: Upon the completion of the inspection the architect will develop and transmit to the contractor a deficiency list.
- E. Contractor's Responsibilities: The contractor(s), subcontractors, vendors and suppliers shall repair or replace work found to be defective.
 - 1. The contractor shall not be responsible for the repair and/or replacement of materials damaged as a result of abuse.
- F. Schedule for Correction of Work: All work identified on the deficiency list shall be correct within ninety days of the date of the nine month inspection.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 CLOSEOUT PROCEDURES

- A. General Operating and Maintenance Instructions:
 - 1. Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at site with Owner's personnel to provide necessary basic instruction in proper operation and maintenance of entire Work.
 - 2. Where installers not experienced in required procedures, include instruction by manufacturer's representatives.
 - 3. As part of this instruction provide detailed review of following items:
 - a. Maintenance manuals
 - b. Record documents
 - c. Spare parts and materials
 - d. Tools
 - e. Lubricants
 - f. Fuels
 - g. Identification systems
 - h. Control sequences

- i. Hazards
 - j. Cleaning
 - k. Warranties, bonds, maintenance agreements and similar continuing commitments.
4. As part of this instruction for operating equipment demonstrate following procedures:
- a. Start-up
 - b. Shut-down
 - c. Emergency operations
 - d. Noise and vibration adjustments
 - e. Safety procedures
 - f. Economy and efficiency adjustments
 - g. Effective and energy utilization

3.02 FINAL CLEANING

- A. General:
- 1. Special cleaning requirements for specific units of Work included in appropriate sections of Divisions 2 through 16.
 - 2. General Cleaning during regular progress of Work required by General Conditions and included under section "Temporary Facilities".
- B. Cleaning:
- 1. Provide final cleaning of Work at time indicated.
 - 2. Employ experienced workers or professional cleaners for final cleaning.
 - 3. Clean each surface or unit of work to condition expected from normal, commercial building cleaning and maintenance program.
 - 4. Comply with manufacturer's instructions for operations.
 - 5. Complete following cleaning operations before requesting Architect's inspection for certification of Final Acceptance.
 - a. Remove labels not required as permanent labels.
 - b. Clean transparent materials, including mirrors and glass in doors and windows, to polished condition.
 - 1) Remove putty and other substances noticeable as vision-obscuring materials.
 - 2) Replace chipped or broken glass and other damaged transparent materials.
 - c. Clean exposed exterior and interim hard-surfaced finishes to dust-free condition, free of dust, stains, films and similar noticeable distracting substances.
 - 1) Restore reflective surfaces to their original reflective condition.
 - 2) Leave concrete floors broom clean.
 - 3) Vacuum carpeted surfaces.
 - d. Wipe surfaces of mechanical and electrical equipment clean.
 - 1) Remove excess lubrication and other substances.
 - 2) Clean plumbing fixtures to sanitary condition.
 - 3) Clean light fixtures and lamps.
 - e. Clean project site, including landscape development areas, of rubbish, litter and foreign substances.
 - 1) Sweep paved areas to a broom-clean condition; remove stains, spills, and other foreign deposits.
 - 2) Rake grounds that are neither paved nor planted, to smooth, even-textured surface.
- C. Pest Control: Engage experienced exterminator to make final inspection of project, and rid project of rodents, insects, and other pests.
- D. Removal of Protection: Except as otherwise indicated or requested by Architect, remove temporary protection devices and facilities installed during course of work to protect previously completed work during remainder of construction period.

- E. Compliances:
1. Comply with safety standards and governing regulations for cleaning operations.
 2. Do not burn waste materials at site.
 3. Do not bury debris or excess materials on Owner's property.
 4. Do not discharge volatile or other harmful or dangerous materials into drainage systems.
 5. Remove waste materials from site and dispose of in lawful manner.
 6. Where extra materials of value remaining after completion of associated work have become Owner's property, dispose of these to Owner's best advantage as directed.

END OF SECTION 01 7700

**SECTION 02 4119
SELECTIVE DEMOLITION**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

- A. Extent of selective demolition work indicated on drawings and described herein.
- B. Types of Selective Demolition Work: Demolition requires selective removal and subsequent offsite disposal of following:
 - 1. Portions of building structure indicated on drawings and required to accommodate new construction.
 - 2. Removal of interior partitions and walls indicated on drawings.
 - 3. Removal of gypsum board ceiling and wood framing systems where indicated.
 - 4. Removal of doors and frames indicated "remove."
 - 5. Removal of built-in casework indicated "remove."
 - 6. Removal of existing windows indicated to be bricked-in.
 - 7. Removal of existing breeze windows indicated to be enclosed.
 - 8. Removal of existing finishes where new finishes are specified to be installed.
 - 9. Removal of existing structural members where indicated. Work includes temporary shoring necessary.
 - 10. Removal of existing concrete floor slabs where indicated.
 - 11. Removal and protection of existing fixtures and equipment items indicated "salvage."
 - 12. Removal of construction, including existing finishes, as necessary for installation of items specified in Division 25 and Division 26.
 - 13. Enclosure of openings resulting from equipment removal.
 - 14. Replacement of finishes where removed for installation of new materials, finishes and/or equipment.
- C. Contractor Removed / Owner Salvaged items: Items that are "Contractor removed/Owner salvaged" identified on drawings and in specifications.
- D. Removal work specified elsewhere: Roofing removal is specified in another Division 2 Section.
- E. Related work specified elsewhere:
 - 1. Remodeling construction work and patching included within respective sections of specifications, including removal of materials for re-use and incorporated into remodeling or new construction.
 - 2. Relocation of pipes, conduits, ducts, other mechanical and electrical work specified by respective trades.
- F. Owner removed items: Owner will remove movable items plus certain fixed items identified on drawings as "Owner removed".

1.03 REFERENCED STANDARDS

- A. The following standards shall be incorporated into the contract documents by reference:
 - 1. American National Standards Institute (ANSI); ANSI A10.6; 1983, Demolition Operations - Safety Requirements.
 - 2. Code of Federal Regulations (CFR); 40 CFR 61-SUBPART M; National Emission Standard for Asbestos.

1.04 SUBMITTALS

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

2. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
3. Existing plumbing, mechanical and electrical systems shall remain in operation until such time as new systems are placed into service and functioning properly.
4. Coordinate with Owner's continuing occupation of portions of existing building, with Owner's partial occupancy of completed new addition, and with Owner's reduced usage during summer months.

1.05 JOB CONDITIONS

- A. Occupancy:
 1. Owner to continuously occupy areas of building immediately adjacent to areas of selective demolition.
 2. Conduct selective demolition work in manner to minimize need for disruption of Owner's normal operations.
 3. Provide min. of 72 hours advance notice to Owner of demolition activities impacting Owner's normal operations.
- B. Condition of Structures:
 1. Owner assumes no responsibility for actual condition of items or structures to be demolished.
 2. Conditions existing at time of commencement of contract maintained by Owner insofar as practicable.
 3. Variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
- C. Partial Demolition and Removal:
 1. Remove items indicated to be removed, but of salvable value to Contractor, from structure as work progresses.
 2. Transport salvaged items from site when removed.
 3. Storage or sale of removed items on site not permitted.
- D. Protections:
 1. Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.
 2. Provide protective measures required to provide free and safe passage of Owner's personnel and general public to and from occupied portions of building.
 3. Erect temporary covered passageways required by authorities having jurisdiction.
 4. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.
 5. Protect from damage existing finish work to remain in place and becomes exposed during demolition operations.
 6. Protect floors with suitable coverings when necessary.
 7. Construct temporary insulated solid dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations performed.
 8. Equip partitions with dustproof doors and security locks if required.
 9. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to insure that no water leakage or damage occurs to structure or interior areas of existing building.
 10. Remove protections at completion of work.
- E. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.
 1. Repair adjacent surfaces and materials with materials to match existing in composition, thickness, finish and appearance.
- F. Traffic:
 1. Conduct selective demolition operations and debris removal in manner to ensure min. interference with roads, streets, walks, and other adjacent occupied or used facilities.
 2. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction.
 3. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

- G. Explosives:
 - 1. Use of explosives not permitted.
- H. Utility Services:
 - 1. Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.
 - 2. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction.
 - 3. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
- I. Environmental Controls:
 - 1. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level.
 - 2. Comply with governing regulations pertaining to environmental protection.
 - 3. Do not use water if creating hazardous or objectionable conditions such as ice, flooding, and pollution.

PART 2 - PRODUCTS

2.01 Materials:

- A. Materials utilized to repair and/or patch areas as a result of minor demolition shall match existing materials and conform to requirements of applicable sections of specification.

PART 3 - EXECUTION

3.01 SCOPE OF WORK

- A. It is the intent of the contract documents to require that the contractor provide demolition activities necessary and required for the performance of the work specified whether such demolition is specifically indicated or not.
 - 1. Notes regarding demolition of existing work are included in specifications and on drawings.
 - 2. These notes are intended to provide a general scope of the demolition work required. However such notes shall not be considered as all inclusive. The contractor shall remove existing construction (materials, finishes and equipment) as required for the installation of the new construction.

3.02 DIMENSIONS:

- A. Existing Dimensions and Conditions: Dimensions indicated on drawings relative to existing conditions are approximate. Contractor shall verify dimensions which affect bid price prior to bidding.
- B. No changes to the contract amount shall be considered if the change is the result of not verifying dimensions.
- C. The drawings indicate the approximate existing conditions. Contractor to field verify all visible conditions prior to bidding. Notify the architect of any discrepancies between drawings and existing conditions prior to receipt of bids.

3.03 GENERAL WORK

- A. Immediately report existing utilities and service lines discovered during removal operations to Owner, Architect and Installer responsible for particular utility or service involved.
- B. Remove rubbish and debris using duct chutes or containers adequately enclosed to prevent unwanted debris spill during removal.
- C. Burn, store or sell no material either in building or on site.
 - 1. All removed material and debris, unless identified otherwise, is Contractor's property; Contractor remove immediately and completely from site.

- D. Remove no structural component without prior approval of Architect. Provide braces and shores where necessary to preserve integrity of existing structure.
- E. Where removal of entire walls or floors required, percussion-type methods permitted; where removal of portions of existing walls or floors required or new openings required in existing walls or floors, perform by saw cutting in order to prevent damage to remaining construction.
- F. Perform demolition or removal work required to accomplish work of Contract Documents, whether specifically noted or not, with care not to damage existing construction remaining.
- G. Repair and refinish damages to existing construction to match existing using materials and methods of construction consistent with existing conditions.

3.04 INSPECTION

- A. Prior to commencement of selective demolition work, inspect areas in which work performed.
 - 1. Photograph existing conditions to structure surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from selective demolition work.
 - 2. File photographs with Owner's Representative prior to starting work.
- B. Contractor take photographs (35 mm) throughout interior and exterior of buildings to document existing conditions prior to starting of construction; keep photographs on file at jobsite.
 - 1. This requirement included to protect Contractor's interest, and filing of such list will preclude possibility of damages being assigned Contractor for repairs.
 - 2. Contractor does not have responsibility of repairing any damages not result of his own negligence.
- C. When Contractor moves on site and starts construction, it is be construed as his complete acceptance of existing site conditions.

3.05 PREPARATION

- A. Prior to commencing demolition activities contractor shall identify, to the greatest extent possible, the location of all utilities. Contractor shall refer to existing building drawings, contact school system maintenance personnel and review site conditions to assist in determining utility locations.
 - 1. Identified utilities to be flagged.
 - 2. Utilities which could be located and identified or reasonably assumed to be in or below materials being demolished which are damaged through the performance of this contract shall be repaired or replaced to original condition without added cost to the contract.
- B. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures demolished and adjacent facilities remaining.
 - 1. Cease operations and notify Owner's Representative immediately if safety of structure appears endangered.
 - 2. Take precautions to support structure until determination made for continuing operations.
- C. Cover and protect furniture, equipment and fixtures to remain from soiling or damage when demolition work performed in rooms or areas from which such items not removed.
- D. Erect and maintain dust-proof partitions and closures required to prevent spread of dust or fumes to occupied portions of building.
 - 1. Where selective demolition occurs immediately adjacent to occupied portions of building, construct dust-proof partitions of min. 4" studs, 5/8" drywall (joints taped) on occupied side, 1/2" fire-retardant plywood on demolition side, and fill partition cavity with sound-deadening insulation.
 - 2. Provide weatherproof closures for exterior openings resulting from demolition work.
- E. Locate, identify, stub off and disconnect utility services not indicated to remain.
 - 1. Provide by-pass connections as necessary to maintain continuity of service to occupied areas of building.
 - 2. Provide min. of 72 hours advance notice to Owner if shut-down of service necessary during change-over.

3.06 REMOVAL OF EXISTING CONSTRUCTION

- A. Where either indicated on contract documents or required by existing conditions contractor to remove existing construction as necessary for the performance work of this contract.
 - 1. Remove existing site concrete, including walks, drives, concrete curb and gutter where required for installation of new work.
 - 2. Remove existing asphalt pavement where required for new work.
- B. Where new materials indicated to be installed the contractor shall remove existing materials completely unless specifically noted otherwise.
- C. Removal of existing construction shall be accomplished using means and methods necessary to minimize damage to adjacent and/or remaining materials and finishes.
- D. Where new finishes are specified to be installed, the contractor shall, unless noted otherwise, remove the existing finish completely.
 - 1. Where new floor covering is specified to be installed the contractor shall remove the existing flooring and adhesive or setting bed completely.
 - 2. Where new base is specified to be installed the contractor shall remove existing base and adhesive completely.
 - 3. Where new ceiling is specified to be installed the contractor shall remove the existing ceiling tile(s), grid(s) and suspension system(s) completely.
- E. Where tile (asphalt, vinyl or vinyl asbestos) is scheduled to be removed, remove tile and adhesive as asbestos containing material. Refer to other sections of these specifications for requirements.

3.07 INSTALLED ITEMS

- A. The contractor shall assume that plumbing and electrical utilities exist within and below existing floor slabs and within existing partitions.
 - 1. Remove concrete slabs and masonry walls in small sections and as necessary to identify location of utilities.
 - 2. Relocate utilities encountered during demolition and as necessary to maintain existing remaining systems in fully operational condition.
- B. Perform removal/demolition of existing masonry and concrete to install new conduit and other new concealed piping by saw cutting and not percussion type methods.
- C. Unless specifically noted otherwise, all new plumbing, mechanical and electrical systems are to be run concealed in walls and above finished ceilings.
- D. Where indicated to install new work concealed in masonry walls, install work (conduit, plumbing, etc.) as follows:
 - 1. Remove concrete block face shell by saw cutting.
 - 2. Install conduit in block cell.
 - 3. Install new face shell "slab" of texture and appearance to match adjacent area.

3.08 DEMOLITION AND PATCHING

- A. Perform all demolition and patching required to accomplish the work called for under this contract.
- B. All material shown to be removed, unless noted otherwise, shall become the property of the contractor and shall be removed from the site and disposed of in a legal manner.
- C. Repair and patch all damaged materials (finishes, systems, etc.) resulting from work performed under this contract. The "patched" work shall match the existing material, finish, and color of adjacent surrounding materials.

- D. Where existing materials, surfaces, or finishes damaged due to work of this contract the contractor shall repair such damaged areas with new materials of type, size, and finish to match existing.
- E. Where removal of materials results in openings in existing surfaces contractor shall fill opening with materials and using methods to match existing.
- F. Perform selective demolition work in systematic manner.
 - 1. Use such methods required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.
 - 2. Demolish concrete and masonry in small sections.
 - 3. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
 - 4. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors or framing.
 - 5. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
 - 6. Demolish foundation walls to min. depth of 12" below existing ground surface.
 - 7. Demolish and remove below-grade wood or metal construction.
 - 8. Break up below-grade concrete slabs.
 - a. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions.
 - b. Use power saw where possible.
 - 9. Completely fill below-grade areas and voids resulting from demolition work.
 - 10. Provide fill consisting of approved earth, gravel or sand, free of trash and debris, stones over 6" diameter, roots or other organic matter.
- G. Concrete Floor Slabs:
 - 1. Where indicated or where necessary to complete specified work remove existing concrete floor slab. Where existing slab removed replace as follows:
 - a. Compact subgrade to 98% standard proctor.
 - b. Provide 4" thick compacted sand fill.
 - c. Provide 6 mil floor slab membrane.
 - d. Pour min. 4" thick concrete slab reinforced with 6X6 6/6 WWM
 - 2. Where existing concrete slab is damaged through performance of work of this contract repair with materials and methods to match adjacent surfaces.
 - 3. At locations where wall is removed and concrete slab is un-level between adjacent spaces provide materials and labor necessary to level slab.
- H. Removal of Concrete Block Walls:
 - 1. Where existing masonry walls indicated to be removed and wall extends below finished floor slab the contractor shall remove existing masonry wall to a point not less than 8" below finished floor slab. Fill gap between floor slabs with minimum of 8" thick concrete. Level floor slabs to within 1/8" in 10'-0". Where necessary provide additional leveling/grinding necessary to provide smooth transition between adjacent floor levels.
 - 2. Masonry; Concrete Block and Brick:
 - a. New face brick and mortar to match existing in size, color, bond, joint type and overall appearance.
 - b. New concrete block to match existing in type of coursing.
- I. Building Finishes:
 - 1. Floor Tile; Soft: Where new floor tile is indicated to be installed the contractor shall remove the existing floor tile and adhesive completely.
 - 2. Contractor shall note that in certain areas more than one layer of floor tile may exist. For the purposes of this contract the contractor shall consider all vinyl floor tile to be asbestos.
 - 3. Floor Base: Where new floor base (rubber) indicated to be installed the contractor shall remove existing base and adhesive completely.

4. Floor Tile; Hard: Where new finished flooring indicated to be installed where hard tile (ceramic or quarry) exists the contractor shall remove existing tile and setting bed.
5. Where new floor covering is soft tile or carpet fill depressed floor slab area with concrete topping to level slab.
6. Ceiling Tile and Grid: Where new ceiling tile and grid indicated to be installed the contractor shall remove the existing ceiling tile, grid and hanger wire system completely.
7. Contractor shall note that in certain areas more than one ceiling system may exist. Verify area prior to bidding.

J. Doors, Frames and Hardware:

1. Where indicated, remove existing door, frame and hardware completely.
2. Turn door and hardware over to Owner and dispose of frame unless otherwise noted.
3. Where removal of door and frame results in an opening in an existing wall, where the wall is scheduled to remain, enclose opening with new materials and methods to match existing unless detailed or noted otherwise.

K. Windows:

1. Where indicated to remove existing windows, remove existing window, glass, trim and related materials completely.
2. Where existing breeze window indicated to be enclosed perform following work, unless specifically detailed or noted otherwise:
3. Remove and dispose of existing glass completely.

3.09 FLOOR SLABS

A. Where indicated to install new work concealed in or below floor, install work (conduit, plumbing) completely under existing slab.

1. Remove slab by saw cutting.
2. When patching slab compact existing grade to 98% standard proctor density.
3. Fill with min. 4000 psi concrete with maximum 3" slump.
4. Reinforce with 6x6 - 10/10 WWM.
5. Install #3 rebars 4" long, drilled 2" into existing slab; space 3'-0" max. o.c.

3.10 MECHANICAL - ELECTRICAL WORK

A. Demolition: Where necessary for installation of the new plumbing and mechanical systems, remove existing finishes, materials, equipment and related items as required to allow for the proper installation of new materials and equipment.

1. Where the removal of a system component results in an opening or hole in surface fill in opening with materials to match adjacent surfaces.
2. Where installation of new materials and equipment results in a damage to the existing materials and/or finishes, replace materials with new to match existing.

B. Disconnect all service piping necessary to completion of removal operations.

1. Cap and abandon service lines not extended or re-used.
2. Re-route services which must be maintained.
3. Remove plumbing and heating fixtures from site if not specifically noted on drawings as "Owner salvaged".

C. Disconnect all power and illumination necessary for completion of removal operations.

1. Abandon services not extended or re-used.
2. Re-route services which must be maintained.
3. Remove items not "Owner salvaged" from site.

- D. Remove plumbing, mechanical and electrical equipment not indicated to be reused.
 - 1. Completely remove equipment, curbs, support structure and associated plumbing, mechanical and electrical services for equipment.
 - 2. Where opening exists in roof structure as a result of equipment removal, enclose opening with materials similar to adjacent area.
 - a. Use of wood as part of enclosure not acceptable.
- E. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design encountered, investigate and measure both nature and extent of conflict.
 - 1. Submit report to Owner's Representative in written, accurate detail.
 - 2. Pending receipt of directive from Owner's Representative rearrange selective demolition schedule as necessary to continue overall job progress without delay.
- F. Plumbing and Mechanical Systems:
 - 1. For additional demolition requirements refer to engineering drawings.
 - 2. Where new plumbing and mechanical system indicated to be installed contractor to remove existing abandoned system completely.
 - 3. Portions of existing systems required to maintain proper operation of system shall be retained in working condition.
 - 4. Where existing plumbing or mechanical is to be removed the contractor shall repair/replace existing remaining surface to match adjacent area.
 - 5. If a question exists as to what material should be used contact architect for direction prior to proceeding.
 - 6. Where new or existing pipes penetrate new or existing finished ceilings within area of building being renovated, neatly cut tile 1/4" larger than size of pipe, caulk gap and provide escutcheon ring of finish to match ceiling grid around pipe at ceiling. Secure to ceiling.
- G. Electrical Systems:
 - 1. Where new electrical system indicated to be installed contractor to remove existing abandoned system completely.
 - 2. Portions of existing systems required to maintain proper operation of system shall be retained in working condition.
 - 3. Abandoned existing electrical fixtures, conduit, and cable to be removed completely except as noted. Where conduit is in located masonry walls or below slab remove conduit to a point behind finished surface, cap conduit, and repair finished surface.
 - 4. The contractor is reminded that all electrical conduit/wire shown on electrical drawings is shown in a schematic form only. All new conduit to be run on solid backing. Do not run conduit across windows, openings or other areas where solid backing not available.
 - 5. All new electrical conduit to be run concealed in existing and/or new construction unless otherwise noted or directed by the architect.

3.11 SALVAGE MATERIALS

- A. Salvage Items: Where indicated on Drawings as "Owner Salvage," carefully remove indicated items, clean, store and turn over to Owner and obtain receipt.
 - 1. Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets, antiques, and other articles of historic significance remain property of Owner.
 - 2. Notify Owner's Representative if such items encountered and obtain acceptance regarding method of removal and salvage for Owner.
- B. Throughout the existing building there are existing items not scheduled for re-use which the owner wishes to salvage. The contractor shall remove, in good condition, all items listed below. The owner will view potential salvage materials and determine which of the materials removed will be retained by owner.
 - 1. Materials retained by owner shall be stored in area on site designated by owner. The owner will remove material from site.
 - 2. Materials not selected by owner for salvage shall be disposed of by the contractor in a legal fashion. Contractor to pay all disposal costs.

- C. The contractor shall remove the following materials in good conditions and allow the owner to inspect to determine whether the owners wishes to salvage:
1. Architectural:
 - a. Doors and Hardware (excluding frames)
 - b. Hardware
 - c. Windows (excluding interior breeze windows)
 - d. Chalk boards.
 - e. Teachers and Storage Cabinets.
 - f. Base and overhead Cabinets.
 - g. Fire Extinguishers.
 2. Plumbing:
 - a. Plumbing fixtures (Water closets, Urinals, and Lavatories)
 - b. Electric water coolers, boilers, and water heaters.
 - c. Copper piping
 - d. Motors and Pumps.
 - e. Additional Items identified on engineering drawings.
 3. Mechanical:
 - a. Window, Wall and Pad HVAC units
 - b. Boiler, Chiller, Fans, Motors
 - c. Exhaust Fans
 - d. Packaged HVAC units
 - e. Additional Items identified on engineering drawings.
 4. Electrical System:
 - a. Electrical panels, disconnects and switch gear.
 - b. Electrical conduit over 1"
 - c. Wire larger than #8
 - d. Additional Items identified on engineering drawings.
- D. All items scheduled for removal not specifically listed above (or elsewhere) to be salvaged shall become the property of the contractor and shall be disposed of off site by contractor.

3.12 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove debris, rubbish and other materials resulting from demolition operations from building site.
1. Transport and legally dispose of materials off site.
 2. If hazardous materials encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.
 3. Burning of removed materials not permitted on project site.

3.13 CLEAN-UP AND REPAIR

- A. Upon completion of demolition work, remove tools, equipment and demolished materials from site.
1. Remove protections and leave interior areas broom clean.
- B. Repair demolition performed in excess of that required.
1. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work.
 2. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION 02 4119

**SECTION 04 2000
UNIT MASONRY**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
- B. Requirements of this section apply to masonry work specified in Division-4 section "Reinforced Unit Masonry".

1.02 DESCRIPTION OF WORK

- A. Extent of each type of masonry work indicated on drawings.
- B. Types of masonry work required include:
 - 1. Concrete unit masonry
 - 2. Prefaced concrete masonry units, (split face, ground and polished faced)
 - 3. Decorative concrete masonry units.
 - 4. Brick masonry
 - 5. Reinforcing steel.
 - 6. Masonry joint reinforcement.
 - 7. Ties and anchors.
 - 8. Flashing
- C. Products furnished, but not installed, under this Section include the following:
 - 1. Dovetail slots for masonry anchors, installed under Division 3 Section "Cast-in-Place Concrete."
 - 2. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 5 Section "Structural Steel."
- D. Products installed, but not furnished, under this Section include the following:
 - 1. Steel lintels, and shelf angles for unit masonry, furnished under Division 5 Section "Metal Fabrications.
 - 2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."
 - 3. Hollow-metal frames in unit masonry openings, furnished under Division 8 Section "Steel Doors and Frames."

1.03 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
 - 1. Reinforced unit masonry specified in other Division-4 Section 'Reinforced Unit Masonry'
 - 2. Masonry Dampproofing is specified in Division-7 section "Bituminous Dampproofing".
 - 3. Rigid Cavity Insulation is specified in Division-7 section "Insulation".
 - 4. Brick vents are specified in a Division-10 section "Louvers and Vents".
 - 5. Brick paving is specified in Division-32 section "Unit Pavers".
- B. Requirements of this section apply to masonry work specified in Division-4 section "Reinforced Unit Masonry".

1.04 QUALITY ASSURANCE

- A. General: Where codes, standards or regulations referenced in this section, compliance with such codes, standards or regulations shall be considered the minimum applicable standards. Where requirements of this sections exceed the requirements of the referenced standard the requirements of this section shall govern.
 - 1. Where reference is made to ASTM standards, such reference shall exclude reference to provisions related finish of concrete masonry units.

- B. Codes and Standards: Comply with provisions of following, except as otherwise indicated herein:
1. National Concrete Masonry Association (NCMA): 'Specifications for Design and Construction of Load Bearing Concrete Masonry' latest edition.
 2. American Concrete Institute (ACI): ACI 530.1 'Specifications for Masonry Structures' and ACI 531' Building Code Requirements for Masonry Structures'
- C. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire endurance determined by testing in compliance with ASTM E 119 by recognized testing and inspecting organization or by another means, as acceptable to authority having jurisdiction. In addition to compliance with ASTM standards the contractor shall furnish verification that units comply with one of the following:
1. U.L. (Underwriters Laboratory) certification from concrete masonry manufacturer showing that manufacturer is certified to make U.L. rated masonry.
 2. Certification by Georgia licensed professional engineer (P.E.) that concrete masonry used in fire walls meets minimum requirements for Underwriters Laboratories Publication UL618, Class D-2, C-3 and B-4 masonry units for minimum physical dimensions, minimum equivalent thickness, procedure of manufacture, quality of materials used and mix design quantities.
- D. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from **ONE** manufacturer for each different product required for each continuous surface or visually related surfaces.
- E. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.
- F. Field Constructed Mock Ups: Prior to installation of masonry work, erect sample wall panels to further verify selection made for color and textural characteristics, under sample submittals of masonry units and mortar, and to represent completed masonry work for qualities of appearance, materials and construction; build mock-ups to comply with following requirements:
1. Locate mock-ups on site in locations indicated or, if not indicated, as directed by Architect.
 2. Construct number of mock-up panels necessary to obtain an acceptable mock up in color and quality. The contractor shall assume that four mock panels will be required.
 3. Build mockups for the following types of masonry in sizes of approximately 6' long by 4' high by full thickness, including face and back-up wythes as well as accessories.
 - a. Separate mock-up for each specified brick, typical exterior brick wall, each backed by one or more types of concrete masonry units specified so that each is represented, using specified mortar(s), damproofing, insulation and joint reinforcing.
 - b. Typical interior partition of concrete masonry units.
 - c. Provide examples of the following joint types:
 - 1) "V" joint at brick.
 - 2) "V" and concave joint at standard concrete masonry.
 - 3) Concave joint at split face concrete masonry.
 4. Where masonry is to match existing, erect panels parallel to existing surface.
 5. Erect mock-ups in presence of Architect.
 6. Protect mock-ups from the elements with weather resistant membrane.
 7. Retain mock-ups during construction as standard for judging completed masonry work.
 8. When directed, demolish mock-ups and remove from site.
 9. Approved mock-ups shall be utilized to establish the acceptable standard of quality to be utilized throughout the project.
- G. Pre-Commencement Conference: Prior to laying masonry and performing associated work, meet at project site with general contractor mason, installers of related work, and other entities concerned with performance of masonry systems, including test agencies, governing authorities, Architect, and Owner.
1. Record discussions and agreements and furnish copy to each participant.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with specified requirements.
 - 1. Submit complete product data, including engineering calculations, for each condition where pre-cast concrete lintels are to be used.
- B. Shop Drawings: Show fabrication and installation details for the following:
 - 1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars.
 - 2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection Purposes: Submit samples of following materials:
 - 1. Unit masonry samples in small scale form showing full extent of colors and textures available for each type of exposed masonry unit required.
 - 2. Colored masonry mortar samples showing full extent of colors available.
- D. Samples for Verification Purposes: Submit the following samples:
 - 1. Unit masonry samples for each type of exposed masonry unit required; include in each set full range of exposed color and texture expected in completed work.
 - a. Include size variation data verifying that actual range of sizes for brick falls within ASTM C 216 dimension tolerances for brick where modular dimensioning indicated.
 - b. Concrete masonry samples shall include samples of each block type and size utilized. Block types to include: stretcher, bull nose, double bull nose, lintel, spandrel, non-fire rated, and fire rated units.
 - 2. Colored masonry mortar samples for each color required showing full range of color expected in finished work.
 - a. Label samples to indicate type and amount of colorant used.
- E. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
 - 1. Each type of masonry unit required.
 - a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
 - b. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.
 - 2. Mortar complying with property requirements of ASTM C 270 & BIA M1.
 - 3. Grout mixes complying with compressive strength requirements of ASTM C 476 Include description of type and proportions of grout ingredients.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle masonry units to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion or other causes.
- C. Store cementitious materials off ground, under cover and in dry location.
- D. Store aggregates where grading and other required characteristics can be maintained.
- E. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

1.07 PROJECT CONDITIONS

- A. Protection of Work:
 - 1. During erection, cover top of walls with heavy waterproof sheeting at end of each day's work.
 - 2. Cover partially completed structures when work not in progress.
 - a. Extend cover min. of 24" down both sides and hold cover securely in place.
 - 3. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.

4. Do not apply concentrated loads for minimum 3 days after building masonry walls or columns.
 5. Staining: Prevent grout or mortar or soil from staining face of masonry to be exposed or painted.
 6. Remove immediately grout or mortar in contact with masonry to be exposed or painted.
 7. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
 - a. Extend covering up face of wall a minimum of 3'-0".
 - b. Do not place covering in mortar joint for anchorage.
 - c. Maintain protective covering for duration of project.
 8. Protect sills, ledges and projections from droppings of mortar.
 9. Protect adjoining finished materials and products from staining or disfigurement resulting from exposure to mortar, cement, lime or acid.
- B. Cold Weather Protection:
1. Do not lay masonry units which are wet or frozen.
 2. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface dry to touch.
 3. Remove masonry damaged by freezing conditions.
 4. Do not lay masonry when:
 - a. Air temperature 40 degrees F on a falling thermometer.
 - b. If probable temperatures below 40 degree F encountered before mortar set, unless providing adequate means of protection acceptable to Architect.
- C. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.

PART 2 - PRODUCTS

2.01 BRICK

- A. General: Comply with referenced standards and other requirements indicated below applicable to each form of brick required.
1. Brick shall be uniform in appearance and free from chipped, broken, crazed or otherwise damaged units.
- B. General: Comply with referenced standards, other requirements indicated, applicable to each type brick. Provide shapes indicated and as follows:
1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
 2. Provide square-edged units for outside corners, unless indicated as bullnose.
- C. Size: Provide bricks manufactured to following actual dimensions:
1. Size: Match Existing.
 2. Color, Texture, Finish and Appearance: Match Existing:
 3. Coursing: Match Existing
 4. Face Brick shall be uniform in size. Maximum variation in length of brick shall not exceed 1/16".
- D. Provide special molded shapes where indicated and for application requiring brick of form, size and finish on exposed surfaces which cannot be produced from standard brick sizes by sawing.
1. At arched windows provide pre-shaped brick of dimensions suitable for arch and as necessary to avoid field cutting of brick while maintaining proper alignment of edge of brick with radius point.
- E. For sills, caps, soldiers, pierced screen walls, and similar applications resulting in exposure of brick surfaces which otherwise would be concealed from view, provide uncured or unfroged units with all exposed surfaces finished.
- F. Facing Brick: ASTM C 216 as follows:
1. Grade SW; Type FBS (normal size and color variations).
 2. Compressive Strength: 8,000 psi, average, per ASTM C 67.
 3. Application: Use where brick exposed, unless otherwise indicated.

4. Texture and Color: Match Architect's sample.
- G. Building Common Brick: ASTM C 62, and as follows:
 1. Grade SW.
 2. Application: Use where brick indicated for concealed locations.

2.02 CONCRETE MASONRY UNITS

- A. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.
 1. Concrete Masonry units shall be free of surface and edge imperfections, irregularities, chippage, and other defects.
 2. Edges of block shall be smooth, straight and square and free from irregularities.
 3. Face texture of block shall be dense, smooth and regular in appearance. Course or irregular textured block unacceptable.
 4. The face texture of each specialty unit (lintels, bull nose, solid, half size units, ect) shall match the face texture of the stretcher blocks.
- B. Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
 1. Face texture of specialty blocks to match stretcher blocks.
- C. Pre-Cast Masonry 'U-Lintels': Engineer, provide and install precast concrete 'U-lintels' where underside of lintel exposed to view.
 1. Design: Precast masonry lintels to be designed and constructed by the manufacturer to safely support the weight of the wall above the opening and the roof dead and live tributary loads for each location without excessive deflection.
 - a. Each precast lintel shall have a depth of no less than 8" with 2 #5 bars at top and bottom of *precast* section with section grouted solid.
 - b. Where span of lintel requires a depth of greater than 8", as indicated on structural drawings, a composite member consisting of a precast section at the bottom and unit masonry section(s) at the top. The portion of the lintel above the precast section to be reinforced as indicated on structural drawings.
 - c. Provide minimum bearing for precast and unit masonry portions of lintels as indicated on structural drawings for width of open over which lintel is placed.
 - d. Lintels to be designed to center over openings. Bearing at each end of lintel to be equal.
 2. Reinforcing:
 - a. Deformed Reinforcing: ASTM A615, Grade 40 or 60.
 - b. Prestressing Strand: ASTM A416 270 ksi LL
 3. Fabrication:
 - a. Unless specified otherwise, conform to PCI MNL-116.
 - b. Non-prestressed units to be fabricated with concrete with a minimum 28 day compressive strength of 3,500 psi.
 - c. Prestressed units to be fabricated with concrete with a minimum 28 day compressive strength of 6,000 psi.
 - d. Units shall have a sand block finish.
 4. Products: High Strength Pre-cast pre-stressed concrete as manufactured; Subject to compliance with technical provisions, provide one of the following:
 - a. Cast Crete, Corp (813) 621-4641; www.castcrete.com
 - b. Modern Pre-Cast
 - c. Quality Precast Company
- D. Provide bull nosed units for outside corners, except where indicated as square edged.
- E. Concrete Masonry Units (CMU): Provide units complying with characteristics indicated below for Grade, Type, face size, exposed face and, under each form included, for weight classification.
 1. Grade N; Type II Non-moisture controlled units.
 2. Size: Nominal face dimensions of 16" long x 8" high (15-5/8" x 7-5/8" actual) x thicknesses indicated.
 3. Exposed Faces: Provide the following as indicated on drawings:
 - a. Primary Block: Manufacturer's standard gray color and smooth uniform face texture, if not otherwise

indicated. Face of block to be free of cracks, chips and other imperfections.

4. Fire rated units:
 - a. Fire rated units: Face texture to match that of non-fire-rated walls.
 - b. Block in a smoke, 20 minute, 1 hour and 2 hour rated partitions shall meet requirements for a Class D-2 (2 hour) rated block.
 - c. Block in a 3 hour rated partitions shall meet requirements for a Class C-3 (3 hour) rated block.
 - d. Block in a 4 hour rated partitions shall meet requirements for a Class B-4 (4 hour) rated block.
5. Hollow Loadbearing Block: ASTM C 90 and as follows:
 - a. Weight Classification: Lightweight.
6. Solid Loadbearing Block: ASTM C 145 and as follows:
 - a. Weight Classification: Lightweight.
7. Concrete Building Brick: Provide units complying with ASTM C 55 and characteristics indicated below for grade, type, size and weight classification.
 - a. Grade: Same as indicated for concrete block.
 - b. Type: Same as indicated for concrete block.
 - c. Size: As indicated.
 - d. Size: Non-Modular Standard: 2-1/4" x 3-3/4" x 8"; unless noted otherwise.
 - e. Weight Classification: Lightweight.

2.03 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C 91.
 1. For colored aggregate mortars use masonry cement of natural color or white as required to produce mortar color indicated.
 2. Mortar utilized in fire rated partitions shall comply with applicable requirements of specified U.L. Design number.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Aggregates for Mortar: ASTM C 144, except for joints less than 1/4" use aggregate graded with 100% passing No. 16 sieve.
 1. White Mortar Aggregates: Natural white sand or ground white stone.
 2. Colored Mortar Aggregates: Ground marble, granite or other sound stone, as required to match Architect's sample.
- D. Aggregate for Grout: ASTM C 404, Size No. 2.
- E. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes.
 1. Use only pigments with record of satisfactory performance in masonry mortars.
 2. Color Range:
 - a. Brick Masonry: Gray, white or buff range.
 - b. Integrally Colored Concrete Masonry: Match masonry.
 - c. Natural (gray) Masonry: No mortar pigment required.
 3. Products: Subject to compliance with technical provisions, provide one of the following:
 - a. "Magnolia", Blue Circle Inc.
 - b. "SGS Mortar Colors"; Solomon Grind-Chem Service Inc.
 - c. "True Tone Mortar Colors"; Davis Colors; A subsidiary of Rockwood Industries, Inc.
- F. Powdered Waterproofing for Mortar: Powder waterproofing shall be a dry mixture of stearates, water-reducing agents, and processed dry aggregates that coat the internal pores and channels of cementitious mixes with a water repellent compound and impart a reduced capillary action, thereby minimizing the entrance and transmission of water without decreasing strength.
 1. Approved Manufacturer, subject to conformance with specification:
 - a. Sonneborn, Hydrocide Powder.
 - b. Addiment Incorporated
 - c. Krete Industries, Inc.

G. Water: Clean, and potable.

2.04 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES

- A. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:
1. Mill Galvanized Steel Wire: ASTM A 82 for uncoated wire and with ASTM A 641 for zinc coating of class indicated below:
 - a. 0.10 oz. per sq. ft. of wire surface.
 - b. Application: Use for masonry not exposed to exterior or earth.
 2. Hot-Dip Galvanized Steel Wire: ASTM A 82 for uncoated wire and with ASTM A 153, Class B-2 (1.5 oz. per sq. ft. of wire surface) for zinc coating applied after prefabrication into units.
 - a. Application: Use for masonry exposed to exterior and in contact with earth.
 3. Austenitic Stainless Steel Wire: ASTM A 580, AISI Type 304 (UNS S30400) alloy.
 - a. Application: Use where indicated.
 4. Zinc-Coated (Galvanized) Steel Sheet: Carbon steel with zinc coating complying with ASTM A 525, Coating Designation G90.
 - a. Application: Use for dovetail slots and where indicated.
 5. Hot-Dip Galvanized Carbon Steel Sheet: ASTM A 366, Class 2 or ASTM A 635; hot dip galvanized after fabrication to comply with ASTM A 153; Class B.
 - a. Application: Use for anchors.
- B. Joint Reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units, and complying with requirements indicated below:
1. Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 1/2" elsewhere.
 2. Wire Size for Side Rods: 9 ga. (0.1483") diameter.
 3. Wire Size for Cross Rods: 9 ga. (0.1483") diameter.
 4. For **single-wythe** masonry provide type as follows with single pair of side rods:
 - a. Truss design with diagonal cross rods spaced max. 16" o.c. Provide products of one of following:
 - 1) AA Wire Products Co.; AA600 "Blok-Truss".
 - 2) Dur-O-Wall, Inc.; "Truss" Single Wythe.
 - 3) Hohmann & Barnard, Inc.; #120 "Truss-Mesh".
 - 4) Masonry Reinforcing Corporation of America; Series 300, 2 wire single wythe truss type.
 - 5) National Wire Products Industries; single wythe truss type.
 - 6) Southern Construction Products, Inc.; single wythe truss type.
 5. For **multi-wythe** masonry provide type as follows:
 - a. Truss design with diagonal cross rods spaced not more than 16" o.c..
 - 1) **Brick with Concrete Masonry Back-up (no cavity)**: One side rod for each face shell of concrete masonry backup and one rod for brick wythe. Provide products of one of following:
 - a) AA Wire Products Co.; AA610 "Tri-Lok".
 - b) Dur-O-Wall, Inc.; "Composite Truss Trirod"
 - c) Hohmann & Barnard, Inc.; #130 "Truss-Tri-Mesh"
 - d) Masonry Reinforcing Corporation of America; Series 300, 3-wire composite truss type.
 - e) National Wire Products Industries; 3-wire composite truss type.
 - f) Southern Construction Products, Inc.; truss 3-wire style.
 - 2) **Brick with Concrete Masonry Back-up (uninsulated cavity)**: One side rod for each face shell of concrete masonry backup and one rod for brick wythe with crimped moisture drip in cross rods at center of cavity. Provide products of one of following:
 - a) AA Wire Products Co.; AA610 "Tri-Lok" with moisture drip.
 - b) Dur-O-Wall, Inc.; "Cavity Truss Trirod"
 - c) Hohmann & Barnard, Inc.; #135 "Cavity Truss-Tri-Mesh"
 - d) Masonry Reinforcing Corporation of America; Series 300, 3-wire cavity truss type with moisture drip.
 - e) National Wire Products Industries; 3-wire cavity truss type with moisture drip.
 - f) Southern Construction Products, Inc.; truss 3-wire style with moisture drip.

- 3) **Brick with Concrete Masonry Back-up (insulated cavity):** One side rod for each face shell of concrete masonry backup and adjustable pintel/eye type or winged loop/box type tie 16" o.c. extending into brick wythe. Provide products of one of following:
 - a) AA Wire Products Co.; AA625 "Econo-Eye-Blok-Truss" or AA675 "Econo-Cavity Blok-Truss III"
 - b) Dur-O-Wall, Inc.; "Dur-O-Eye"
 - c) Hohmann & Barnard, Inc.; #170 "Adjustable Eye-Wire" or #AF- "Ajustoflex Truss".
 - d) Masonry Reinforcing Corporation of America; Series 900, cavity hook and eye.
 - e) National Wire Products Industries; double hook and eye truss or truss adjustable tab tie.
 - f) Southern Construction Products, Inc.; "double-eye" truss - rectangular type.
 - 4) **Two Wythe Concrete Masonry:** One side rod for each face shell of concrete masonry back-up and of concrete masonry facing wythe. Provide products of one of following:
 - a) AA Wire Products Co.; AA630 4-wire "Blok-Truss"
 - b) Dur-O-Wall, Inc.; "Truss - Double"
 - c) Hohmann & Barnard, Inc.; #140 "Truss-Twin-Mesh"
 - d) Masonry Reinforcing Corporation of America; Series 300, 4-wire composite truss type.
 - e) National Wire Products Industries; truss double side rod.
 - f) Southern Construction Products, Inc.; truss 4-wire style.
 - 5) **Two Wythe Brick:** Two side wire truss design with diagonal cross rods spaced max. 16" o.c. Provide products of one of following:
 - a) AA Wire Products Co.; AA600 "Blok-Truss".
 - b) Dur-O-Wall, Inc.; "Truss" Single Wythe.
 - c) Hohmann & Barnard, Inc.; #120 "Truss-Mesh".
 - d) Masonry Reinforcing Corporation of America; Series 300, 2 wire single wythe truss type.
 - e) National Wire Products Industries; single wythe truss type.
 - f) Southern Construction Products, Inc.; single wythe truss type.
- C. Bent-Wire Ties: Where indicated only provide individual prefabricated bent-wire units complying with requirements indicated below:
1. Wire Size: 0.1875" diameter.
 2. Length: Provide units of length indicated but not less than required for embedment into each wythe of 1.5" for solid units and for embedment of tie end into face shells of hollow units, with min. 5/8" mortar cover on exterior face joints, 1/2" elsewhere.
 - a. Ties to be of a width approximately 2" less than overall wall thickness.
 3. Tie Shape for Hollow Masonry Units Laid with Cells Vertical: Rectangular with ends welded close and not less than 4" wide. Provide products of one of following:
 - a. AA Wire Products Co.; AA304.
 - b. Dur-O-Wall, Inc.; D/A 510.
 - c. Hohmann & Barnard, Inc.; #BWT
 - d. Masonry Reinforcing Corporation of America; 1501.
 - e. National Wire Products Industries; Series 650.
 - f. Southern Construction Products, Inc.; Series 500 box tie (without drip).
 4. Tie Shape for Solid Masonry Unit Construction: Z-shaped ties with ends bent 90° to provide hooks min. 2" long. Provide products of one of following:
 - a. AA Wire Products Co.; AA309.
 - b. Dur-O-Wall, Inc.; D/A 500.
 - c. Hohmann & Barnard, Inc.; #ZWT
 - d. Masonry Reinforcing Corporation of America; 1600.
 - e. Southern Construction Products, Inc.; Series 500 zee tie (without drip).
 5. Type for Masonry Where Coursing Between Wythes Do Not Align: Adjustable ties composed of two parts, one with pintle, the other with an eye. Provide products of one of following:
 - a. AA Wire Products Co.; AA303.
 - b. Dur-O-Wall, Inc.; D/A 515.
 - c. Hohmann & Barnard, Inc.; 750.
 - d. Masonry Reinforcing Corporation of America; 1801.
 - e. National Wire Products Industries; Series 915.

- f. Southern Construction Products, Inc.; pintle and eye adjustable wall tie.
- D. Flexible Anchors: Where flexible anchors are indicated for connecting masonry to structural framework, provide 2-piece anchors as described below which permit vertical or horizontal differential movement between wall and framework parallel to, but resist tension and compression forces perpendicular to, plane or wall.
- 1. For anchorage to concrete framework, provide manufacturer's standard anchors with dovetail anchor section formed from 0.1046" (12 gage) thick sheet metal and triangular-shaped wire tie section sized to extend within 1" of masonry face.
 - a. Wire Size: 0.1875" diameter.
 - b. Provide products of one of following:
 - 1) AA Wire Products Co.; AA100 + AA200 or AA200V as applicable.
 - 2) Dur-O-Wall, Inc.; D/A 100 + D/A 720 or D/A 723 as applicable.
 - 3) Hohmann & Barnard, Inc.; 305 + 315.
 - 4) Masonry Reinforcing Corporation of America; 2102.
 - 5) National Wire Products Industries; Series 500 + Series 506 or Series 506 as applicable.
 - 6) Southern Construction Products, Inc.; 10802 + Series 700.
 - 2. For anchorage to steel framework, provide manufacturer's standard anchors with welded anchor section formed from 0.1046" (12 gage) thick sheet metal and triangular-shaped wire tie section sized to extend within 1" of masonry face.
 - a. Wire Size: 0.1875" diameter.
 - b. Provide products of one of following:
 - 1) AA Wire Products Co.; AA401B + AA400.
 - 2) Dur-O-Wall, Inc.; D/A 207 + D/A 702.
 - 3) Hohmann & Barnard, Inc.; 359F + #VWT.
 - 4) Masonry Reinforcing Corporation of America; 1000 + 1100.
 - 5) National Wire Products Industries; No. 102 + No. 650
 - 6) Southern Construction Products, Inc.; 703 + Series 700.
 - 3. Refer to structural drawings for rigid masonry ties at some structural steel members.
- E. Masonry Veneer Anchors: Two-piece assemblies which permit vertical or horizontal differential movement between wall and framework parallel to, but resist tension and compression forces perpendicular to, plane of wall; consisting of wire tie section and metal anchor section for attachment over sheathing to metal studs and complying with the following requirements.
- 1. Wire Size: 0.1875" diameter.
 - 2. Wire Tie Length: As required to extend within 1" of masonry veneer face.
 - 3. Triangular Ties: Provide products of one of following:
 - a. AA Wire Products Co.; AA401S-1 tie + AA401S anchor.
 - b. Dur-O-Wall, Inc.; D/A 702 tie + D/A 213 anchor.
 - c. Hohmann & Barnard, Inc.; V-tie + DW-10 anchor.
 - d. Masonry Reinforcing Corporation of America; 1100 tie + 1001 anchor.
 - e. National Wire Products Industries; Series 200 tie + No. 125 anchor.
 - f. Southern Construction Products, Inc.; Series 700 tie + 710 anchor.
 - 4. Metal Fasteners for Steel Studs: Steel drill screws, #10 diameter x length required to penetrate steel stud flange by not less than 3 exposed threads, complying with ASTM C 954 except with hex washer head and neoprene washer, cadmium-plated.
- F. Lateral Wall Ties: Provide straps of form and length indicated, fabricated from sheet metal strips of following width and thickness, unless otherwise indicated.
- 1. Width: 1-1/2".
 - 2. Thickness: 14-ga.
 - 3. Size: 20" long with 2" vertical bend each end.
 - 4. Configuration: "Z" shaped, corrugated.
 - 5. Provide products of one of following:
 - a. AA Wire Products Co.; AA211Z
 - b. Dur-O-Wall, Inc.; D/A 301C.
 - c. Masonry Reinforcing Corporation of America; 300Z.
 - d. National Wire Products Industries.

- e. Southern Construction Products, Inc.
- G. Corrugated Wall Ties: Provide straps of form and length indicated, fabricated from sheet metal strips of following width and thickness, unless otherwise indicated.
- 1. Width: 7/8".
 - 2. Thickness: 22-ga.
 - 3. Size: As required; penetrate brick 2"; turn up face of wall 2".
 - 4. Provide products of one of following:
 - a. AA Wire Products Co.; AA211Z
 - b. Dur-O-Wall, Inc.; D/A 301C.
 - c. Masonry Reinforcing Corporation of America; 300Z.
 - d. National Wire Products Industries.
 - e. Southern Construction Products, Inc.
 - 5. Metal Fasteners for Steel Studs: Steel drill screws, #10 diameter x length required to penetrate steel stud flange by not less than 3 exposed threads, complying with ASTM C 954 except with hex washer head and neoprene washer, cadmium-plated.
- H. Anchor Bolts: Provide steel bolts with hex nuts and flat washers complying with ASTM A 307, Grade A, hot-dip galvanized to comply with ASTM C 153, Class C, in sizes and configurations indicated.
- 2.05 CONCEALED FLASHING MATERIAL
- A. Composite Wall Flashing: Composite waterproof flashing membrane consisting of min. 32 mil pliable, highly adhesive rubberized asphalt compound bonded to an 8 mil min. high density, cross-laminated polyethylene film.
- 1. Self-sealing, self-healing, gully adhering, composite flexible flashing
 - 2. Bonded integrally and completely to high density four ply cross-laminated polyethylene film
 - 3. Protected by silicone coated release sheet removed immediately before installation.
 - 4. Remain flexible, waterproof in concealed masonry
 - 5. Color: Black
 - 6. Thickness: Min. 40 mils total thickness.
 - 7. Products: Subject to compliance with requirements, provide one of the following:
 - a. Grace Masonry Products, Perma-A-Barrier wall flashing
 - b. "Mel-Rol", W. R. Meadows
 - c. "MiraDRI 860/861", TC MiraDRI
 - d. Hyload
 - e. Aqua-Flash
 - f. Sandell Manufacturing Company
 - g. York Manufacturing Inc.
- B. Adhesive/Cements for Flashings: Of type recommended by manufacturer of flashing material for use indicated.
- 2.06 MISCELLANEOUS MASONRY ACCESSORIES
- A. Reinforcing Bars: Deformed steel, ASTM A 615, Grade 60.
- B. Non-Metallic Expansion Joint Strips: Premolded, flexible cellular neoprene rubber filler strips complying with ASTM D 1056, Grade RE41E1, capable of compression up to 35%, of width and thickness indicated.
- C. Premolded Control Joint Strips: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- 1. Polyvinyl chloride complying with ASTM D 2287, General Purpose Grade, Designation PVC-63506 **OR**
 - 2. Styrene-butadiene rubber compound complying with ASTM D 2000, Designation 2AA-805.
- D. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

- E. Weepholes: Provide one of following for weepholes:
1. Plastic Tubing: Medium density polyethylene, outside diameter and length as indicated below:
 - a. 3/8" X 4".
 - b. Application: Weep Holes at thru wall flashing at base of wall.
 2. Cotton Cord:
 - a. Min. of 3/8" dia. sash cord of length required to produce 2" exposure above finish grades on exterior of brickwork and extended 18" vertically in cavity between wythes.
 - b. Keep weep holes and cavity area free of mortar droppings and debris.
 - c. Application: Weep holes other than those defined above.

2.07 CAVITY DRAINAGE

- A. Cavity Drainage: Cavity drainage system manufactured with high density polyethylene or 100% recycled.
1. Cut in dovetail fashion or folded to provide a 6 inch step. Size to fit thickness of cavity.
 2. 90% open weave
 3. Manufacture:
 - a. Hohmann & Banard, Inc.
 - b. Mortar net
 - c. Cav Clear

2.08 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2 cup dry measure) and laundry detergent (1/2 cup dry measure) dissolved in one gallon of water.
- B. Acidic Cleaner: Manufacturer's standard strength general purpose cleaner designed for new masonry surfaces of type indicated; composed of blended organic and inorganic acids combined with special wetting systems and inhibitors; expressly approved for intended use by manufacturer of masonry units being cleaned.
1. Products: Subject to compliance with requirements, provide following:
 - a. "Sure Kleen" No. 600 Detergent; ProSoCo, Inc.
 - b. "DC-6 Brick Cleaner"; Acme Brick Co.
 - c. "Series 800"; Superior
 - d. "Brick Bath"; Goldblatt
 - e. "202" or "202V"; Diedrich

2.09 MORTAR AND GROUT MIXES

- A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or other admixtures, unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
- B. Scheduling: Mortar shall be placed in final location within 2-1/2 hours from time of initial mixing.
1. Re-tempering of mortar prohibit.
 2. Mortar not in place within time period listed to be discarded.
- C. Mixing:
1. Combine and thoroughly mix cementitious, water and aggregate in mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.
 2. Accurately measure all ingredients using appropriate measuring devices to assure proper proportions and to achieve uniform color, texture and quality.
 3. Measuring by "shovel" not acceptable.
 4. For masonry located in **Exterior Walls** (both veneer and backup), add one pound of powder waterproofing additive in each bag of masonry cement.

- D. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specifications, for types of mortar required, unless otherwise indicated.
 - 1. Use Type N (750 PSI) mortar for above grade non-load bearing brick veneer, interior non-load bearing masonry and for other applications where another type not indicated.
 - 2. Use Type S (1800 PSI) mortar for above grade interior and exterior load bearing (reinforced an non-reinforced) masonry and where indicated.
 - 3. Use Type M (2500 PSI) mortar for masonry below grade and in contact with earth, and where indicated.
- E. Colored Pigmented Mortar:
 - 1. Select and proportion pigments with other ingredients to produce color required.
 - 2. Do not exceed pigment-to-cement ratio of 1-to-10, by weight.
- F. Grout for Unit Masonry: Use ready-mixed grout of strength and consistency indicated.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. In addition to the requirements contained herein, masonry work shall comply with the Current Edition of the Brick Institute of America, Technical Notes, Section 7A and 7B and ACI 530.1 Current Edition.
 - 1. Where conflicts exist between the requirements of this Section, the Technical Notes, and the requirements of ACI, the more stringent of the requirements shall govern.
- B. Lay brick and block as described herein and as follows:
 - 1. 'Cull' units which are damaged, chipped, cracked, or otherwise defective.
 - 2. Broken, Chipped, Cracked, irregular or otherwise defective units shall not be utilized in construction of building. Such units placed in construction shall be removed and replaced without cost to the owner.
 - 3. Do not lay units with irregular (rough) edges or non-uniform face texture. Where such units are placed in wall, contractor to remove and replace without additional cost.
- C. Wetting Clay Brick:
 - 1. Wet brick made from clay or shale which have ASTM C 67 initial rates of absorption (suction) of more than 30 grams per 30 sq. in. per minute.
 - 2. Use wetting methods which ensure each clay masonry unit being nearly saturated but surface dry when laid.
- D. Do not wet concrete masonry units.
- E. Cleaning Reinforcing: Before placing, remove rust, scale, earth and other coatings from reinforcing.
- F. Unless noted or detailed otherwise masonry coursing shall be based on finished floor elevation, with top of first course of CMU masonry being 8" above finished floor.
 - 1. Should elevation of footing(s) require, cut first course of block as necessary to ensure that the top of block aligns with finished slab elevation.
 - 2. Do NOT attempt to "level" top of footing using excess mortar or grout.
- G. Unless noted or detailed otherwise every three brick courses shall align with CMU coursing.
 - 1. Should elevation of footing(s) require, cut first course of brick as necessary to ensure that the top of brick aligns with finished slab elevation.
 - 2. Do NOT attempt to "level" top of footing using excess mortar or grout.
- H. Thickness:

1. Build cavity and composite walls, floors and other masonry construction to full thickness shown.
 2. Build single-wythe walls (if any) to the actual thickness of masonry units, using units of nominal thickness indicated.
- I. Build chases and recesses shown or required for work of other trades.
 1. Provide min. 8" of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.
 - J. Build full height masonry pilasters where indicated and where required.
 1. Construct full height masonry pilaster at each recessed fire extinguisher cabinet where cabinet is shown to be placed on (or in) a fire rated partition.
 2. Construct full height masonry pilaster at each column located in a masonry wall. Pilaster shall fully conceal column and comply with fire rating requirements noted herein.
 - K. Leave openings for equipment to be installed before completion of masonry work.
 1. After installation of equipment, complete masonry work to match work immediately adjacent to opening.
 - L. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges.
 1. Cut units as required to provide continuous pattern and to fit adjoining work.
 2. Use full-size units without cutting where possible.
 3. Use dry cutting saws to cut concrete masonry units.
 - M. Matching Existing Masonry Work:
 1. Match coursing, bonding, color and texture of new masonry work with existing work.
- 3.02 CONSTRUCTION TOLERANCES
- A. Variation from Plumb:
 1. For vertical lines and surfaces of columns, walls, and arises do not exceed $\pm 1/8"$ in any story height or 12' max.
 2. For vertical alignment of head joints do not exceed $\pm 1/8"$ in any story height or in 12'-0" ..
 - B. Variation from Level:
 1. For bed joints and lines of exposed lintels, sills, parapets, and other conspicuous lines do not exceed $\pm 1/8"$ in any bay or 20' max.
 2. For top surface of bearing walls do not exceed $\pm 1/8"$ in 10' max. or $1/16"$ within length and width of any single unit.
 - C. Variation of Linear Building Line: For position shown in plain and related portion of columns, walls and partitions, do not exceed $1/8"$ in any bay or 20' max.
 - D. Variation in Cross-Sectional Dimension: For columns and walls do not exceed $\pm 1/4"$.
 - E. Variation in Mortar Joint Thickness:
 1. Unless otherwise indicated, make all bed and head joints $3/8"$, $\pm 1/16"$, with max. joint thickness of $1/2"$.
 2. Approved field mock up panel establishes acceptable masonry appearance.
- 3.03 LAYING MASONRY WALLS
- A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate opening, movement-type joints, returns and offsets.
 1. Avoid use of less-than-half-size units at corners, jambs and wherever possible at other locations.
 - B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.
 1. Accurately space courses.
 2. Coordinate with other work.
 - C. Pattern Bond:

1. Lay exposed masonry in bond pattern as follows:
 - a. Brick: Running bond except as otherwise indicated.
 - b. Split-faced Concrete Masonry: Running bond.
 - c. 2-, 3-, or 4-hour Fire-rated Concrete Masonry: Running bond.
 - d. All other Concrete Masonry: Stacked bond.
 2. Lay concealed masonry with all units in wythe in running bond or bonded by lapping not less than 2".
 3. Bond and interlock each course of each wythe at corners.
 4. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.
 5. At openings in walls (cased openings, doors and window) where stacked bond used, align edge of full block with each side of opening. Where necessary in order to maintain alignment, cut block to be centered above opening. Do not use cut block at jambs.
- D. Stopping and Resuming Work:
1. Rack back 1/2-unit length in each course; do not tooth.
 2. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh mortar.
- E. Built-in Work:
1. Build in work of other sections indicated to be built-in with CMUs as work progresses; include anchors, wall plugs, expansions joints, control joints, and accessories. Space and properly align built-in parts; exercise care not to disturb other materials from position.
 - a. Fill spaces around built-in items with fine grout.
 - b. Coat aluminum materials to prevent aluminum-cement chemical reaction or electrolytic action between aluminum and steel.
 - c. Where built-in items embedded in cores of hollow masonry units, place layer of metal lath in joint below and rod grout into core.
 2. Fill around built-in items solidly with masonry.
 3. At wall mounted/recessed electro magnetic door holders grout block at solid at recessed wall assembly.
 4. Fill space between hollow metal frames and masonry solidly with fine grout, unless otherwise indicated.
 5. Exterior frames: Provide thermal break at exterior frames.
 - a. Extruded polystyrene board insulation at perimeter
 - b. Thickness indicated, min. 3/4"
 6. Built-in items embedded in cores of hollow masonry:
 - a. Layer metal lath in joint below.
 - b. Rod mortar, grout into core to completely encase and surround embedded item.
 7. Cores in hollow masonry units under bearing plates, beams, lintels, post, similar items:
 - a. Grout min. 3 courses (24") under item, unless otherwise indicated.
 8. Lay masonry to receive flashing with smooth joints without projections which could puncture flashing materials.
 9. Install minimum 8" solid end bearing full height of wall from floor to bearing points for lintels, beams and other supporting members by filling cores with cement grout, unless otherwise indicated.
 10. Provide lintels and bond beams where indicated using lintel blocks laid with joints matching adjacent work; reinforce as indicated, fill block with concrete.
 11. Saw-cut cut-outs for electrical devices and recessed wall mounted equipment.
 - a. Cut opening size required for device; do not overcut opening size.
 - b. Cut-out in block shall not exceed the size of the item to the extent that a normal coverplate or trim device will not cover the hole.
- F. Bull Nosed Block: Where bull nosed specified, the following to apply:
1. Exposed edges of block at outside corners, jamb block at surface mounted door jambs, view windows, window frames and other locations to be bull nosed.
 2. Where bull nosed block is used provide square nosed units, one (1) course high, at floor to accommodate base and at ceiling, one course high to accommodate ceiling grid.
- 3.04 LAYING FIRE RATED MASONRY PARTITIONS
- A. Masonry contractor shall maintain a current U.L. System Design Manual on site for the duration of the project. Design manual shall contain a full, detailed description of design numbers referenced herein.

- B. Where specific U.L. Design numbers are referenced the contractor shall construct partition or wall in total compliance with the requirements of the listed U.L. design number.
 - 1. Concrete masonry units in fire rated partitions shall be of classifications described above (D-2, C-3, B-4).

- C. Construct fire rated walls in accordance with provisions of applicable U.L Design numbers listed below:
 - 1. Smoke, 20 and 30 minute, and 1 hour rated walls: U 905 or U 906; 1 Hour Rated
 - 2. 2-hour walls: U 905 or U 906; 2 Hour Rated
 - 3. 3-hour walls: U 904 or U 907; 3 Hour Rated
 - 4. 4-hour walls: U 901 or U 907; 4 Hour Rated

- D. Unless more stringent requirements noted, partitions and walls surrounding mechanical rooms, electrical rooms, and similar spaces shall, as a **minimum**, be considered as being **1 hour rated**.

- E. Unless otherwise noted, partitions and walls on either side of corridors shall, as a **minimum**, be considered as being non-rated, **smoke tight** partitions in sprinkled buildings and **1 hour fire** rated on non-sprinkled buildings.

- F. Where fire rated or smoke tight partitions or walls are specified the contractor shall maintain the continuity of the fire rating and smoke enclosure whether specifically shown on drawings or not.
 - 1. All openings and penetrations through fire rated partitions shall be sealed using materials and methods which will maintain the specified fire rating **AND** prevent the passage of smoke.
 - 2. All openings and penetrations through smoke rated partitions shall be sealed using materials and methods which will prevent the passage of smoke and provide a minimum of a 1 hour fire rating.

- G. Unless noted otherwise extend fire rated and smoke partitions to roof deck and seal as required to maintain integrity of smoke tight enclosure and required fire rating.

- H. Where steel columns occur in either fire rated or smoke partitions, the continuity of the rating shall be maintained by extending Nominal 8" concrete block across the face of the column.
 - 1. Concrete block "pilaster" shall extend a minimum of 1'-0" past each side of the column. Pilaster shall extend from finished floor to fire rated assembly or underside of roof deck.
 - 2. Where recessed devices (Switches, outlets, junction boxes, etc.) occur in fire rated partitions of two (2) hour or greater ratings, seal around recessed device completely using grout. No voids or openings shall exist.
 - 3. Unless noted otherwise, where fire rated ceiling assemblies are specified or noted, where assembly has a rating equal to or greater than adjacent wall(s), the specified fire rated and smoke partitions to be extended from finished floor to 8" above fire rated assembly. Seal intersection of partition or wall to assembly to maintain specified fire rating **AND** prevent the passage of smoke.
 - 4. Unless noted otherwise, where **NO** fire rated ceiling assemblies are detailed or specified, or where rating of walls is greater than ceiling assembly, extend fire rated and smoke partitions from finished flooring to roof deck and seal with materials and methods which will maintain specified fire rating **AND** prevent the passage of smoke and as approved by the Local Fire Marshal.

3.05 MORTAR BEDDING AND JOINTS

- A. A. Solid brick-size masonry units:
 - 1. Completely fill bed and head joint
 - 2. Butter ends fully with mortar to fill head joints, shove into place
 - 3. Do not slush head joints

- B. Hollow CMU: Provide full mortar coverage on horizontal and vertical face shells
 - 1. Bed face shells and webs in full bed of mortar
 - 2. Starting course on footings where cells not grouted: Spread full mortar bed including areas under cells
 - a. Max. setting bed on foundations of $\frac{3}{4}$ ".
 - b. If foundation uneven, low in excess of $\frac{3}{4}$ ", cut masonry to height for filler course

- C. Maintain joint widths shown, except minor variations to maintain bond alignment
 - 1. 3/8" joints unless otherwise indicated

- D. Exposed joints:
 - 1. Tool when mortar thumb-print hard with jointer slightly larger than joint thickness
 - 2. Produce smooth, dense finish, straight lines of uniform depth, appearance throughout project:
 - 3. Brick Joints: Selected by Architect, "V" or concave joint
 - 4. CMU Joints:
 - a. Generally: Selected by Architect, "V" joint or concave joint
 - b. Kitchen and Toilets: Shallow concave joint
 - c. Split Face CMU: flush
 - 5. Masonry concealed, covered by other materials:
 - a. Flush joints unless otherwise indicated.
 - 6. Immediately after tooled:
 - a. Brush (soft bristled) across joint (90° to joint) and masonry
 - b. Clean of excess mortar, sand

- E. Concealed Joints: Cut joints flush for masonry walls concealed or covered by other materials, unless otherwise indicated.

- F. Remove masonry units disturbed after laying; clean and reset in fresh mortar.
 - 1. Do not pound corners or jambs to shift adjacent stretcher units set in position.
 - 2. If adjustments required, remove units, clean off mortar and reset in fresh mortar.

- G. Collar Joints: After each course laid, fill in vertical longitudinal joint between wythes solidly and with mortar for following masonry work:
 - 1. All exterior walls, except cavity walls, and interior walls and partitions.
 - 2. Exterior walls, except cavity walls.
 - 3. Nonloadbearing interior walls or partitions where metal ties or horizontal reinforcing indicated for structural bonding and nominal thickness of wall or partition required to meet code requirements for height-to-thickness ratio.

3.06 CONCRETE TIE BEAMS

- A. Where horizontal reinforced concrete beams and bond beams shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars.
 - 1. Place small mesh expanded metal lath or wire screening in mortar joints under beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.
 - 2. Do not use sheet metal, felt, or building paper.

- B. Provide concrete block bond beams where detailed. Provide as a minimum concrete block bond beams, reinforced continuously with 2 each #5 rebars, fill solid with grout in the following locations:
 - 1. Where shown on drawings.
 - 2. At top of all interior and exterior walls.
 - 3. In walls over 10'-0" high provide at approximately 8'-0" on center vertically in all interior and exterior walls.

- C. Interrupt concrete bond beam and reinforcing at each expansion and control joint located in masonry wall. Do not run bond beam through control or expansion joint.

3.07 STRUCTURAL BONDING OF MULTI-WYTHE MASONRY

- A. Use continuous horizontal joint reinforcement installed in horizontal mortar joints for bond tie between wythes.

1. Install max. 16" o.c. vertically.
- B. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.
- C. For horizontally reinforced masonry, provide continuity at corners with prefabricated "L" units, in addition to masonry bonding.
- D. Intersecting and Abutting Walls (Load Bearing and Non-Load Bearing): Unless vertical expansion or control joints shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:
 1. Provide individual **lateral wall** ties max. 16" o.c. vertically. If used in hollow masonry units, ends to be embedded in mortar-filled cells (cores).
 2. Provide continuity with horizontal joint reinforcement using prefabricated "T" units.
- E. Load-Bearing Interior Partitions: Build full height of story to underside of solid floor or roof structure above, unless otherwise shown.
- F. Non-Load-Bearing; Fire Rated Interior Partitions: Build full height of story to underside of solid floor or roof structure above, unless otherwise shown.
- G. Non-bearing; Non-Fire Rated Interior Partitions: Build wall to 8" above "upper" ceiling level or if no ceiling exists (on one or both sides) to underside of solid floor or roof structure above, unless noted or detailed otherwise. Where partitions terminate below roof or floor structure provide lateral bracing of partition at maximum of 15'-0" on center; minimum two per section of wall. Bracing to consist of minimum 1-1/2" steel angle extending from top of partition to underside of structure above. Weld angle to plate attached to top of partition and to steel structure.
- H. Concrete Block Chases: Where chases are less than 16" clear width, tie chase walls together with box type wall ties at 16" on center each way.

3.08 HORIZONTAL JOINT REINFORCEMENT

- A. General:
 1. Provide continuous horizontal joint reinforcement as indicated.
 2. Install longitudinal side rods in mortar for entire length with min. cover of 5/8" exterior side of walls, 1/2" elsewhere.
 3. Lap reinforcing min. of 6".
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted omitted.
- D. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections.
 1. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
 2. Space continuous horizontal reinforcement as follows:
 - a. For multi-wythe walls (solid or cavity where continuous horizontal reinforcement acts as structural bond or tie between wythes, space reinforcement as required by code but max. 16" o.c. vertically.
 - b. For single-wythe walls, space reinforcement at 16" o.c. vertically, unless otherwise indicated.
 - c. For parapets, space reinforcement at 8" o.c. vertically, unless otherwise indicated.
- E. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above lintel and immediately below sill.
 1. Extend reinforcement min. of 2'-0" beyond jambs of opening except at control joints.
- F. In addition to wall reinforcement, provide additional reinforcement at openings as required to comply with

above.

3.09 ANCHORING MASONRY WORK

- A. General: Provide anchor devices of type indicated.

- B. Anchor masonry to structural members where masonry abuts or faces structural members to comply with following:
 - 1. Provide open space min. 1" in width between masonry and structural member, unless otherwise indicated.
 - 2. Keep open space free of mortar or other rigid materials.
 - 3. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure. Space anchors maximum 16" o.c. vertically and 24" o.c. horizontally, unless a more stringent requirement noted on drawings..

- C. Anchor single wythe masonry veneer to metal studs with masonry veneer anchors to comply with following requirements:
 - 1. Fasten each anchor section through sheathing to metal studs with 2 metal fasteners of type indicated.
 - 2. Embed tie section in masonry joints.
 - 3. Provide min. 1" air space between back of masonry veneer wythe and face of sheathing.
 - 4. Locate anchor section relative to course in which tie section embedded to allow max. vertical differential movement of tie up and down.
 - 5. Space anchors as indicated but not more than 16" o.c. vertically and 24" o.c. horizontally. Install additional anchors within 1'-0" of openings and at intervals around perimeter not exceeding 3'-0".

3.10 CONTROL AND EXPANSION JOINTS

- A. General:
 - 1. Provide vertical and horizontal expansion, control and isolation joints in masonry where shown.
 - 2. Build-in related items as the masonry work progresses.

- B. Expansion Joints:
 - 1. Expansion joints to be 1" wide unless noted otherwise.
 - 2. Maintain expansion joint clear of mortar by temporarily filling with fiberboard as wall is laid.
 - 3. Discontinue horizontal masonry joint reinforcing 1" from expansion joint.
 - 4. Install elastomeric flashing full height of joint; extend into joint 1" and each side of joint minimum of 6" and secure to wall with metal band and mechanical fasteners at 6" on center vertically. Seal joint between flashing and wall with dampproofing.
 - 5. Leave exterior side open and clean for installation of baking rod and sealant.
 - 6. Install prefabricated metal expansion joint cover over interior joints.

- C. Control Joints:
 - 1. Build in rubber control joints in rabbet furnished in CMU to secure shear flange of joint filler where joints occur in running walls at locations indicated.
 - 2. Unless noted otherwise, brick and CMU control joints to be 3/8" wide, raked out to a depth of 3/4" while the mortar is still plastic.
 - 3. Filled control joint with a non-metallic compressible filler and seal with sealant. Compressible filler and sealant in smoke and rated partitions shall be rated and resist the passage of smoke.
 - 4. Discontinue horizontal wall reinforcing 1" from control joint.
 - 5. Unless closer spacing indicated on drawings, provide control joints in following locations.
 - a. Brick and concrete masonry units (CMU) walls at 30'-0".
 - b. Intersecting walls where either one is more than 10'-0" long.
 - c. Structural steel columns.
 - d. Intersection of masonry and structural slabs, beams and decks.
 - e. Changes in wall thicknesses.

- f. Abrupt changes in wall height.
- 6. Do not provide control joints in the following locations:
 - a. Through lintels.
 - b. Through openings in masonry walls.
 - c. Within 8" of bearing for a structural member.
- 7. Where control joints are run adjacent to door or window openings, run as follows:
 - a. Extend joint up at jamb of door or window to underside of lintel.
 - b. Extend joint horizontally under lintel the distance required to achieve proper bearing (8"; 16", etc; see lintel schedule) using a "bond breaker".
 - c. At end of bond beam bearing turn vertically and extend to top of wall.
 - d. Extend control joint through bond beam. Bond beam to be discontinued at control joints.
- D. Build in horizontal pressure relieving joints where indicated; construct joints by either leaving an air space or inserting non-metallic compressible joint filler of width required to permit installation of sealant and backer rod.
- E. Locate horizontal pressure relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.11 LINTELS

- A. Provide masonry lintels:
 - 1. Where shown on drawings.
 - 2. Where openings of more than 1'-0" for brick size units and 2'-0" for block size units shown without structural steel or other supporting lintels.
 - 3. Where continuity of bearing wall required to support roof structure.
- B. Masonry Lintels to comply with:
 - 1. Provide formed-in-place masonry lintels where required and where indicated.
 - 2. Cure precast lintels before handling and installation.
 - 3. Temporarily support formed-in-place lintels.
 - 4. For hollow concrete masonry unit walls, use specially formed U-shaped lintel units with reinforcement bars placed as shown filled with coarse grout.
 - 5. Provide min. bearing of 8" at each jamb, unless otherwise indicated.
 - 6. Provide reinforcing indicated, if not indicated provide a minimum of 2 #5 rebars continuously.

3.12 MASONRY SUPPORT ANGLES:

- A. Where masonry (brick or block) occurs above a low roof level provide a 3 1/2" x 6" x 3/8" steel angle support for masonry, unless noted or detailed otherwise. Angle to be welded to structural steel frame (joists or beams). Length of angle to be as required for support of masonry, minimum span to be three structural members.

3.13 FLASHING OF MASONRY WORK

- A. Building Envelope Consultant: Flashing at brick located above new and existing roofs to be inspected, on a full time basis, by an approved third party, independent building envelop consultant.
- B. Applications:
 - 1. Base of Wall: Provide elastomeric, through wall type flashing at base of masonry wall.
 - 2. Obstructions to Flow: : Provide concealed flashing in masonry work at, or above, shelf angles, lintels, ledges and other obstructions to downward flow of water in wall to divert such water to exterior.
 - 3. Penetrations in cavity face of Con rete Block: Provide concealed flashings at all penetrations in cavity face of concrete block. Cover columns, pipes, conduits, masonry control and expansion joints full length and height
- C. Type of Flashings:
 - 1. Install Vinyl sheet flashing unless noted otherwise.
 - 2. At locations where flashing indicated to be installed where masonry occurs above a low roof, or walkway cover or where indicated provide and 'Composite Sheet Flashing'.

- D. General Installation:
1. Prepare masonry surfaces smooth and free from projections which could puncture flashing.
 2. Place through-wall flashing on sloping bed of mortar and cover with mortar.
 3. Seal penetrations in flashing with mastic before covering with mortar.
 4. Seal laps in flashing with mastic to provide a watertight condition.
 5. Turn ends of flashing up to form a dam at all points of termination.
 6. Extend flashings through exterior face of masonry and turn down to form drip.
- E. Base of Wall (Sill) Flashing:
1. Flashing to extend from 2" above finished grade or walk/pad to a point 8" above the finished floor.
 2. At 8" above floor turn flashing into mortar joint of concrete block a minimum of 4".
 3. Turn flashing out in brick at an elevation above grade. Extend flashing to exterior face of brick; trim where exposed. Prior to placement of flashing the contractor to verify the elevation of the finished grades to ensure that the flashing and weep holes are located above finished grade.
- F. Flashing at Obstructions and Penetrations: Provide concealed flashing in masonry work at, or above, shelf angles, lintels, ledges and other obstructions to downward flow of water in wall to divert such water to exterior. Provide concealed flashings at all penetrations in cavity face of concrete block. Cover columns, pipes, conduits, masonry control and expansion joints full length and height
1. Extend flashing full length of lintels and shelf angles and min. of 16" into masonry each end.
 2. Extend flashing from exterior face of outer wythe of masonry, through outer wythe, turned up min. of 4", and through inner wythe to within 1/2" of interior face of wall in exposed work.
 3. Where interior surface of inner wythe concealed by furring, carry flashing completely through inner wythe and turn up approximately 2".
 4. At heads and sills turn up ends min. 2" to form pan.
 5. At head of openings, extend flashing a minimum of 16" past edge of opening.
- G. Deformed metal flashing:
1. Interlock end joints
 2. Over-lap deformations min. 1½"
 3. Seal lap with elastic sealant
- H. Install flashing to comply with manufacturers written instructions.
- I. Weep/Ventilation Holes:
1. Weep Holes: Provide weep holes in head joints of first course of masonry immediately above concealed flashings. Space 24" o.c., unless otherwise indicated.
 2. Ventilation Holes: At top of wall, one course below eave provide weep holes for air ventilation/circulation of cavity air. Space at 24" o.c. unless otherwise noted.
- J. Provide weep holes in head joints of first course of masonry immediately above concealed flashings.
1. Space 24" o.c., unless otherwise indicated.
- K. Install reglets and nailers for flashing and other related work where shown built into masonry work.
- L. Installation of flashing to be viewed by Architect prior to covering. Flashing not viewed by Architect prior to covering shall be uncovered for viewing by Architect. All costs for uncovering of flashing and subsequent reconstruction of wall to be paid for by the contractor, whether flashing was originally installed correctly or not.

3.14 INSTALLATION OF REINFORCED UNIT MASONRY

- A. Refer to Division-4 sections "Reinforced Unit Masonry" for installation requirements applicable to reinforced

unit masonry.

3.15 FIELD QUALITY CONTROL

- A. Contractor employ, at his own expense, testing laboratory experienced in performing types of masonry field quality control tests for masonry indicated.
 - I. Comply with requirements for qualification and acceptance of testing laboratory specified in Part 1 for preconstruction testing service.

- B. Prism Test Method:
 - 1. Compression Test: For each type wall construction indicated for testing, test masonry prisms by methods of sampling and testing of ASTM E 447, Method B, and as follows:
 - a. Prepare one set of prisms for testing at 7 days and one for testing at 28 days.
 - b. For brick masonry prisms provide same height-to-thickness ration (h/t) specified under preconstruction testing.
 - c. For concrete masonry prisms provide same height-to-thickness ration (h/t) specified under preconstruction testing.
 - d. Construct tests no less frequently than that required to provide sets of prisms from each 5000 sq. ft. of wall area installed.
 - 2. Report test results in writing and in form specified under each test method, to Architect and Contractor, on same day tests made.

- C. Evaluation of Quality Control Tests:
 - 1. Masonry work, in absence of other indications of noncompliance with requirements, considered satisfactory if results from construction quality control tests comply with minimum requirements indicated.

3.16 PARGING

- A. Parge walls where indicated with Type S or N mortar, in thickness indicated.
- B. Thickness: Not less than 1/2".
- C. Trowel finish to smooth, dense surface.
 - 1. Form wash at top of parging and cove at bottom.
 - 2. Where parging applied in 2 coats, roughen first coat when partially set, let harden for 24 hours and moisten prior to application of second coat.
- D. Damp cure parging for at least 24 hours and protect until cured.

3.17 REPAIR, POINTING, AND CLEANING

- A. General:
 - 1. Pointing, tooling, patching and cleaning shall be performed after the masonry mortar has thoroughly set and cured, but no latter than **one month** after the placement of the masonry
- B. Remove and replace loose, chipped, broken, stained or otherwise damaged masonry units, or if units do not match adjoining units as intended.
 - 1. Remove and replace units with non-uniform face texture or where adjacent units have differing face textures.
 - 2. Remove and replace units containing rough, irregular edges.
 - 3. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

- C. Pointing:
 - 1. During tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar.
 - 2. Point-up all joints including corners, openings and adjacent work to provide neat, uniform appearance, prepared for application of sealants.
- D. Final Cleaning: After mortar thoroughly set and cured, clean masonry as follows
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes.
 - 3. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
- E. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.
- F. Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
- G. Use bucket and brush hand cleaning method described in BIA "Technical Note No. 20 Revised" to clean brick masonry made from clay or shale, except use masonry cleaner indicated below.
 - 1. Detergent.
 - 2. Acidic cleaner; apply in compliance with directions of cleaner manufacturer.
- H. Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable to NCMA "Tek" bulletins.
- I. Protection: Provide final protection and maintain conditions in manner acceptable to Installer, which ensures unit masonry work being without damage and deterioration at time of Final Acceptance.

END OF SECTION 04 2000

**SECTION 04 2250
REINFORCED UNIT MASONRY**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this Section.
- B. Requirements of Section "Unit Masonry" apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of each type of reinforced unit masonry work indicated on drawings and schedules.

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:
 - 1. NCMA "Specifications for the Design and Construction of Load Bearing Concrete Masonry", latest edition.
 - 2. ACI 531 "Building Code Requirements for Concrete Masonry Structures".

1.04 SUBMITTALS

- A. Mill Certificates: Submit steel producer's certificates of mill analysis, tensile and bend tests for reinforcement steel required for Project.
- B. Shop Drawings:
 - 1. Submit complete shop drawings for fabrication, bending, and placement of reinforcement bars.
 - 2. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures."
 - 3. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Refer to Section "Unit Masonry" for masonry materials and accessories not included in this Section.
- B. Reinforcement Bars: Provide deformed bars complying with ASTM A 615, Grade 60.
 - 1. Shop-fabricate reinforcement bars shown bent or hooked.

PART 3 - EXECUTION

3.01 PLACING REINFORCEMENT

- A. General: Clean reinforcement loose rust, mill scale, earth, ice or other materials which reduce bond to mortar or grout.
 - 1. Do not use reinforcement bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

- B. Position reinforcing accurately at spacing indicated.
 - 1. Support and secure vertical bars against displacement.
 - 2. Place horizontal reinforcing as masonry work progresses.
 - 3. Where vertical bars shown in close proximity, provide clear distance between bars of not less than nominal bar diameter or 1" (whichever is greater).
 - 4. For columns, piers and pilasters, provide clear distance between vertical bars as indicated, but not less than 1-1/2 times nominal bar diameter or 1-1/2", whichever is greater.
 - 5. Provide lateral ties as indicated.
- C. Splice reinforcement bars where shown; do not splice at other points unless acceptable to Architect.
 - 1. Provide lapped splices, unless otherwise indicated.
 - 2. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.
 - 3. Provide not less than min. lap shown, or if not shown, as required by governing code.
 - 4. Weld splices where indicated; comply with requirements of AWS D1.4 for welding materials and procedures.
- D. Embed metal ties in mortar joints as work progresses, with min. mortar cover of 5/8" on exterior face of walls and 1/2" at other locations.
- E. Embed prefabricated horizontal joint reinforcement as work progresses, with min. cover of 5/8" on exterior face of walls and 1/2" at other locations.
 - 1. Lap units min. 6" at ends.
 - 2. Use prefabricated "L" and "T" units to provide continuity at corners and intersections.
 - 3. Cut and bend units as recommended by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- F. Anchoring: Anchor reinforced masonry work to supporting structure as indicated.
 - 1. Anchor reinforced masonry walls to non-reinforced masonry where they intersect.

3.02 INSTALLATION, GENERAL

- A. Refer to Section "Unit Masonry" for general installation requirements to unit masonry.
- B. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements.
 - 1. Construct formwork to conform to shape, line and dimensions shown.
 - a. Make sufficiently tight to prevent leakage of mortar grout, or concrete (if any).
 - b. Brace, tie and support as required to maintain portion and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry member hardened sufficiently to carry their own weight and all other reasonable temporary loads placed on them during construction.
 - a. Allow not less than following minimum time to elapse after completion of members before removing shores or forms, provided suitable curing conditions obtained during curing period.
 - 1) 10 days for girders and beams.
 - 2) 7 days for slabs.
 - 3) 7 days for reinforced masonry soffits.

3.03 INSTALLATION OF REINFORCED BRICK MASONRY

- A. Mortar Jointing and Bedding:
 - 1. Pattern Bond:
 - a. Lay exterior wythes in pattern bond to match non-reinforced masonry as specified in Section 04200.
 - b. If running bond used lay in 1/2-running bond with vertical joints in each course centered on units in courses above and below.
 - c. Lay inner wythes (if any) with all units in wythe bonded by lapping min. 2".
 - d. Bond and interlock each course of each wythe at corners and intersections.
 - e. Do not use units with less than 4" nominal horizontal face dimension at corners or jambs.

2. Lay exterior wythes with bed (horizontal) and head (vertical) joints between units completely filled with mortar.
 - a. Slope top of bed joint mortar toward center of walls.
 - b. Butter ends of units with sufficient mortar to completely fill head joints and shove into place.
 - c. Do not furrow bed joints or slush head joints.
 - d. Remove any mortar fins which protrude into grout space.
 3. Maintain joint widths shown for head and bed joints, except for minor variations required to maintain pattern bond.
 - a. If not shown, lay with 3/8" head and bed joints.
- B. Two-Wythes Wall Construction:
1. Lay both wythes as previously specified for exterior wythes.
 2. Maintain grout space (collar or continuous vertical joint between wythes) of width indicated, but adjust, if required, to provide grout space min. 1/2" wider than sum of vertical and horizontal (if any) reinforcement bars placed in grout space.
 3. Do not purge or fill grout space with mortar.
- C. Multi-Wythe Wall Construction:
1. Where walls of 3 or more wythes indicated, lay exterior wythes as previously specified.
 2. Maintain space between wythes as required to allow for laying of number of wythes of unit width shown with min. grout space between wythes.
 3. Allow min. 3/4" of grout between wythes if non-reinforced; if reinforced, allow for grout space min. 1/2" wider than sum of vertical and horizontal (if any) reinforcement bars placed in grout space.
 4. Place or float interior wythe units in grout poured between exterior wythes as work progresses.
 5. Position units to allow min. 3/4" grout between ends and sides of adjacent units.
- D. Limit extent of masonry construction to sections which do not exceed max. pour requirements specified hereafter.
1. Provide temporary dams or barriers to control horizontal flow of grout at ends of wall sections.
 2. Build dams full height of grout pour.
 3. If masonry units used, do not bond into permanent masonry wythes.
 4. Remove temporary dams after completion of grout pour.
- E. Low-Lift Grouting:
1. Use Low-Lift grouting technique with "Fine Grout" per ASTM C 476 for following:
 - a. Two-wythe walls with grout space of 2" or less in width.
 - b. Multi-wythe walls.
 - c. Columns, piers or pilasters where masonry units shown in core areas enclosed by exterior masonry units.
 2. At Contractor's option, low-lift grouting technique may be used for reinforced masonry construction with grout spaces wider than 2", except use "Coarse Grout" mix per ASTM C 476 and place in lifts not to exceed 8" in height.
 3. Construct low-lift masonry by placing reinforcement, laying masonry units and pouring grout as work progresses.
 4. Place vertical reinforcement bars and supports prior to laying of masonry units.
 - a. Extend above elevation of max. pour height as required to allow for splicing.
 - b. Place horizontal reinforcement bars progressively with laying of masonry units.
 5. Limit grout pours as required to prevent displacement of masonry by grout pressures (blowout), but do not exceed 12" pour height.
 6. Lay masonry units prior to each grout pour, but do not construct more than 12" above max. grout pour height in one exterior wythe and 4" above in other exterior wythe.
 - a. Provide metal wall ties if required to prevent blowouts.
 7. Pour grout using container with spout and consolidate immediately by rodding or puddling; do not use trowels.
 - a. Place grout continuously; do not interrupt pouring of grout for more than one hour.
 - b. If poured in lifts, place from center-to-center of masonry courses.
 - c. Terminate pour 1-1/2" below top of highest course in pour.

F. High-Lift Grouting:

1. Use high-lift grouting technique for following masonry construction:
 - a. Two-wythe walls with grout spaces of 2-1/2" or greater width.
 - b. Columns, piers, or pilasters when no unit masonry fill placed in reinforced grout space.
2. Place reinforcement and support in proper position, prior to laying of masonry units, except if placed in mortar joints, place as masonry units laid.
 - a. Place horizontal bars in grout spaces on same side of vertical bars.
3. Construct high-lift masonry by laying masonry to full height and width prior to placing of grout.
 - a. Provide cleanout holes in first course of masonry, and use high-pressure water jet stream to remove excess mortar from grout spaces, reinforcement bars and top surface of structural members which support wall.
 - b. Clean grout spaces daily during construction of masonry.
4. Columns, Piers and Pilasters:
 - a. Omit every other masonry unit around perimeter of member to provide cleanout holes.
 - b. Provide reinforcing bands placed in bed joints as masonry work progresses.
 - c. Provide bands of size and vertical spacing shown, or required by code, but min. 9 gage wire spaced 12" o.c. vertically.
5. Preparation of Grout Spaces:
 - a. Prior to grouting, inspect and clean grout spaces.
 - b. Remove dirt, dust, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces.
 - c. Clean reinforcing and adjust to proper positioning.
 - d. Clean top surface of structural members supporting masonry to ensure bond.
 - e. After cleaning and inspection, close cleanout holes with matching masonry units and brace closures to resist grout pressures.
6. Do not place grout until entire height of masonry attained sufficient strength to resist grout pressure, but min. 3 days curing time.
 - a. Install shores and bracing, if required, before starting grouting operations.
7. Place grout by pumping into grout spaces, unless alternate methods acceptable to Architect.
8. Use "Coarse Grout" per ASTM C 476.
 - a. Rod or vibrate each grout lift during placing and again after excess moisture absorbed, but before plasticity lost.
 - b. Do not penetrate or damage grout placed in previous lifts or pours.
9. Limit grout pours to sections which can be completed in one working day with max. one hour interruption of pouring operation.
 - a. Limit pours so as not to exceed capacity of masonry to resist displacement or loss of mortar bond due to grout pressures.
 - b. Do not exceed 12' pour height.
 - c. Do not exceed 25' horizontal pour dimension.
10. Where pour height exceeds 4', place grout in series of lifts not exceeding 4' height.
 - a. Place each lift as continuous pouring operation.
 - b. Allow min. 30 minutes, max. one hour between lifts of given pour.
11. When more than one pour required to complete given section of masonry, extend reinforcement beyond masonry as required for splicing.
 - a. Pour grout to within 1-1/2" of top course of first pour.
 - b. After grouted masonry is cured, remove temporary dams (if any), and lay masonry units and place reinforcement for second pour section before grouting.
 - c. Repeat sequence, if more pours required.

3.04 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY

- A. General:
 - 1. Do not wet concrete masonry units (CMU).
 - 2. Lay CMU units with full-face shell mortar beds.
 - a. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to distance behind face equal to min. of thickness of longitudinal face shells.
 - b. Solidly bed cross-webs of starting courses in mortar.
 - c. Maintain head and bed joint widths shown, or if not shown, provide 3/8" joints.
 - d. Where solid CMU units shown, lay with full mortar head and bed joints.
- B. Walls:
 - 1. Pattern Bond:
 - a. Lay CMU wall units in bond indicated in Section 04200 with vertical joints in each course centered on units in courses above and below, unless otherwise indicated.
 - b. Bond and interlock each course at corners and intersections.
 - c. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.
 - 2. Maintain vertical continuity of core or cell cavities, if reinforced and grouted, to provide min. clear dimensions indicated and to provide min. clearance and grout coverage for vertical reinforcement bars.
 - a. Keep cavities free of mortar.
 - b. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
 - 3. Where horizontal reinforced concrete beams and bond beams shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars.
 - a. Place small mesh expanded metal lath or wire screening in mortar joints under beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms; do not use sheet metal, felt, or building paper.
 - b. Grout cells to be filled prior to placement of beam concrete.
- C. Columns, Piers and Pilasters:
 - 1. Use CMU units of size, shape and number of vertical core spaces shown.
 - a. If not shown, use units which provide min. clearances and grout coverage for number and size vertical reinforcement bars shown.
 - 2. Provide pattern bond shown, or if not shown, alternate head joints in vertical alignment.
 - 3. Where bonded pilaster construction shown, lay wall and pilaster units together to max. pour height specified.
- D. Grouting:
 - 1. Use "Fine Grout" per ASTM C 476 for filling spaces less than 4" in one or both horizontal directions.
 - 2. Use "Coarse Grout" per ASTM C 476 for filling 4" spaces or larger in both horizontal directions.
 - 3. Preparation of Grout Spaces:
 - a. Prior to grouting, inspect and clean grout spaces.
 - b. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces.
 - c. Clean reinforcing and adjust to proper position.
 - d. Clean top surface of structural members supporting masonry to ensure bond.
 - e. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.
 - 4. Grouting Technique:
 - a. At Contractor's option, use either low-lift or high-lift grouting techniques subject to requirements which follow.
- E. Low-Lift Grouting:
 - 1. Provide min. clear dimension of 2" and clear area of 8 sq. in. in vertical cores grouted.
 - 2. Place vertical reinforcement prior to laying of CMU.
 - a. Extend above elevation of max. pour height as required for splicing.
 - b. Secure in position at top and bottom of bar and at vertical intervals not exceeding 192 bar diameters nor 10 ft.

3. Lay CMU to maximum pour height.
 - a. Do not exceed 4' height, or if bond beam occurs below 4' height stop pour at course below bond beam.
 4. Pour grout using chute or container with spout.
 - a. Rod or vibrate grout during placing.
 - b. Place grout continuously; do not interrupt pouring of grout for more than one hour.
 - c. Terminate grout pours 1-1/2" below top course of pour.
 5. Bond Beams:
 - a. Stop grout in vertical cells 1-1/2" below bond beam course.
 - b. Place horizontal reinforcing in bond beams; lap at corners and intersections as shown.
 - c. Place grout in bond beam course before filling vertical cores above bond beam.
- F. High-Lift Grouting:
1. Do not use high-lift grouting technique for grouting of CMU unless min. cavity dimension 3" and 10 sq. in., respectively.
 2. Provide cleanout holes in first course at all vertical cells filled with grout.
 - a. Locate clean out holes in area not exposed to view.
 - b. Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.
 3. Construct masonry to full height of max. grout pour specified, prior to placing grout.
 - a. Limit grout lifts to max. height of 4' and grout pour to max. height of 12', for single wythe hollow concrete masonry walls, unless otherwise indicated.
 4. Place vertical reinforcement before grouting.
 - a. Place before or after laying masonry units, as required by job conditions.
 - b. Tie vertical reinforcement to dowels at base of masonry and secure at top and at intervals not exceeding 192 bar diameters nor 10'.
 - c. Where individual bars are placed after laying masonry, place wire loops extending into cells as masonry laid and loosen before mortar sets.
 - d. After insertion of reinforcing bar, pull loops and bar to proper position and tie free ends.
 - e. Where reinforcement prefabricated into cage units before placing, fabricate units with vertical reinforcement bars and lateral ties of size and spacing indicated.
 5. Place horizontal beam reinforcement as masonry units laid.
 6. Embed lateral tie reinforcement in mortar joints where indicated.
 - a. Place as masonry units laid, at vertical spacing shown.
 - b. Where lateral ties shown in contact with vertical reinforcement bars, embed additional lateral tie reinforcement in mortar joints.
 - c. Place as shown, or if not shown, provide as required to prevent grout blowout or rupture of CMU face shells, but provide min. No. 2 bars or 8 gage wire ties spaced 16" o.c. for members with 20" or less side dimensions, and 8" o.c. for members with side dimensions exceeding 20".
 7. Do not place grout until entire height of masonry attained sufficient strength to resist displacement of masonry units and breaking of mortar bond.
 - a. Install shores and bracing, if required, before starting grouting operations.
 - b. Place grout by pumping into grout spaces unless alternate methods are acceptable to Architect.
 8. Limit grout pours to sections which can be completed in one working day with max. one hour interruption of pouring operation.
 - a. Place grout in lifts which do not exceed 4'.
 - b. Allow min. 30 minutes, nor max. one hour between lifts of given pour.
 - c. Rod or vibrate each grout lift during pouring operation.
 - d. Place grout in lintels or beams over openings in one continuous pour.
 9. Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1" of vertically reinforced cavities, during construction of masonry.
 10. When more than one pour required to complete given section of masonry, extend reinforcement beyond masonry as required for splicing.
 - a. Pour grout to within 1-1/2" of top course of first pour.
 - b. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting.
 - c. Repeat sequence if more pours are required.

END OF SECTION 04 2250

**SECTION 05 5000
METAL FABRICATIONS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This section includes following metal fabrications:
 - 1. Rough hardware.
 - 2. Pipe bollards.
 - 3. Loose bearing and leveling plates.
 - 4. Loose steel lintels.
 - 5. Shelf and relieving angles.
 - 6. Louver protection screens.
 - 7. Expansion joint covers.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

- A. Structural Performance: Design, engineer, fabricate, and install following metal fabrications to withstand following structural loads without exceeding allowable design working stress of materials involved, including anchors and connections.

1.04 SUBMITTALS

- A. General: Submit following in accordance with General Conditions of Contract and Division 1 Specification Sections.
 - 1. Product data for products used in miscellaneous metal fabrications, including paint products and grout.
 - 2. Shop drawings detailing fabrication and erection of each metal fabrication indicated.
 - a. Include plans, elevations, sections, and details of metal fabrications and their connections.
 - b. Show anchorage and accessory items.
 - c. Provide templates for anchors and bolts specified for installation under other Sections.
- B. Where installed metal fabrications indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis signed and sealed by qualified professional engineer responsible for their preparation.
- C. Submit samples representative of materials and finished products specified herein.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under "Quality Assurance" article.
- E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience.
 - 1. Include list of completed projects with project name, addresses, names of Architects and Owners, and other information specified.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firms experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in Work.

- B. Installer Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.
- C. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel," D1.3 "Structural Welding Code - Sheet Steel", and D1.2 "Structural Welding Code - Aluminum."
 - 1. Certify that each welder satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, undergone recertification.
- D. Engineer Qualifications: Professional engineer licensed to practice in jurisdiction where project located and experienced in providing engineering services of kind indicated that have resulted in successful installation of metal fabrications similar in material, design, and extent to that indicated for this Project.

1.06 PROJECT CONDITIONS

- A. Field Measurements:
 - 1. Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings.
 - 2. Coordinate fabrication schedule with construction progress to avoid delay of Work.
 - a. Where field measurements cannot be made without delaying Work, guarantee dimensions and proceed with fabrication of products without field measurements.
 - b. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions.
 - c. Allow for trimming and fitting.

1.07 SEQUENCING AND SCHEDULING

- A. Sequence and coordinate installation of wall handrails as follows:
 - 1. Mount handrails only on completed walls.
 - 2. Do not support handrails temporarily by any means not satisfying structural performance requirements.
 - 3. Mount handrails only on gypsum board assemblies reinforced to receive anchors, and where location of concealed anchor plates clearly marked for benefit of Installer.

PART 2 - PRODUCTS

2.01 FERROUS METALS

- A. Metal Surfaces, General:
 - 1. For metal fabrications exposed to view upon completion of Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes.
 - 2. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
- B. Steel Plates, Shapes, and Bars: ASTM A 36.
- C. Rolled Steel Floor Plates: ASTM A 786.
- D. Steel Bars for Gratings: ASTM A 569 or ASTM A 36.
- E. Wire Rod for Grating Cross Bars: ASTM A 510.
- F. Steel Tubing: Product type (manufacturing method) and as follows:
 - 1. Cold-Formed Steel Tubing: ASTM A 500, grade indicated below:
 - a. Grade A, unless otherwise shown or required for design loading.
 - 2. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.

- G. Uncoated Structural Steel Sheet: Product type (manufacturing method), quality, and grade, as follows:
 - 1. Cold-Rolled Structural Steel Sheet: ASTM A 611, grade as follows:
 - a. Grade A, unless otherwise indicated or required by design loading.
 - 2. Hot-Rolled Structural Steel Sheet: ASTM A 570, grade as follows:
 - a. Grade 30, unless otherwise indicated or required by design loading.
- H. Uncoated Steel Sheet: Commercial quality, product type (method of manufacture) as follows:
 - 1. Cold-Rolled Steel Sheet: ASTM A 366.
 - 2. Hot-Rolled Steel Sheet: ASTM A 569.
- I. Galvanized Steel Sheet: Quality as follows:
 - 1. Commercial Quality: ASTM A 526, G90 coating designation unless otherwise indicated.
- J. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:
 - 1. Black finish, unless otherwise indicated.
 - 2. Galvanized finish for exterior installations and where indicated.
 - 3. Type F, standard weight (schedule 40), unless otherwise indicated, or another weight, type, and grade required by structural loads.
- K. Gray Iron Castings: ASTM A 48, Class 30.
- L. Malleable Iron Castings: ASTM A 47, grade 32510.
- M. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- N. Concrete Inserts:
 - 1. Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27.
 - 2. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.
- O. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy to be welded.

2.02 GROUT AND ANCHORING CEMENT

- A. Nonshrink Nonmetallic Grout:
 - 1. Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C 621 specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.
- B. Products: Subject to compliance with requirements, provide one of following:
 - 1. Nonshrink Nonmetallic Grouts:
 - a. "Bonsal Construction Grout"; W.R. Bonsal Co.
 - b. "Diamond-Crete Grout"; Concrete Service Materials Co.
 - c. "Euco N-S Grout"; Euclid Chemical Co.
 - d. "Kemset"; Chem-Masters Corp.
 - e. "Crystex"; L & M Construction Chemicals, Inc.
 - f. "Masterflow 713"; Master Builders.
 - g. "Sealtight 588 Grout"; W.R. Meadows, Inc.
 - h. "SonogROUT"; Sonneborn Building Products Div., Rexnord Chemical Products, Inc.
 - i. "Stoncrete NMI"; Stonhard, Inc.

2.03 FASTENERS

- A. General:
 - 1. Provide zinc-coated fasteners for exterior use or where built into exterior walls.
 - 2. Select fasteners for the type, grade, and class required.

- B. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
 - C. Lag Bolts: Square head type, FS FF-B-561.
 - D. Machine Screws: Cadmium plated steel, FS FF-S-92.
 - E. Wood Screws: Flat head carbon steel, FS FF-S-111.
 - F. Plain Washers: Round, carbon steel, FS FF-W-92.
 - G. Drilled-In Expansion Anchors: Expansion anchors complying with FS FF-S-325, Group VIII (anchors, expansion, [nondrilling]), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-B-575, Grade 5.
 - H. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.
 - I. Lock Washers: Helical spring type carbon steel, FS FF-W-84.
- 2.04 PAINT
- A. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.
 - B. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing min. 94% zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.
 - C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.
 - D. Zinc Chromate Primer: FS TT-P-645.
 - E. Field Painting; Refer to Section 09900.
- 2.05 FABRICATION, GENERAL
- A. Form metal fabrications from materials of size, thickness, and shapes indicated but min. needed to comply with performance requirements indicated.
 - 1. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support.
 - 2. Use type of materials indicated or specified for various components of each metal fabrication.
 - B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
 - C. Allow for thermal movement resulting from following max. change (range) in ambient temperature in design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners; base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
 - 1. Temperature Change (Range): 100°F (55.5°C).
 - D. Shear and punch metals cleanly and accurately; remove burrs.
 - E. Ease exposed edges to radius of approximately 1/32", unless otherwise indicated.
 - 1. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
 - F. Remove sharp or rough areas on exposed traffic surfaces.

- G. Weld corners and seams continuously to comply with AWS recommendations and following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
 - H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible.
 - 1. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts.
 - 2. Locate joints where least conspicuous.
 - I. Provide for anchorage of type indicated; coordinate with supporting structure.
 - 1. Fabricate and space anchoring devices to provide adequate support for intended use.
 - J. Shop Assembly:
 - 1. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly.
 - 2. Disassemble units only as necessary for shipping and handling limitations.
 - 3. Use connections that maintain structural value of joined pieces.
 - 4. Clearly mark units for reassembly and coordinated installation.
 - K. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.
 - L. Fabricate joints exposed to weather in manner to exclude water, or provide weep holes where water may accumulate.
- 2.06 ROUGH HARDWARE
- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures.
 - 1. Straight bolts and other stock rough hardware items specified in Division 6 sections.
 - B. Fabricate items to sizes, shapes, and dimensions required.
 - 1. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.
- 2.10 LOOSE BEARING AND LEVELING PLATES
- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area.
 - 1. Drill plates to receive anchor bolts and for grouting as required.
 - 2. Galvanize after fabrication.
 - B. Finish: Factory primed, Field painted.
- 2.11 LOOSE STEEL LINTELS
- A. Provide loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
 - B. Weld adjoining members together to form single unit where indicated.
 - C. Size loose lintels for equal bearing of one inch per foot of clear span but min. 8" bearing at each side of openings, unless otherwise indicated.

- D. Galvanize loose steel lintels located in exterior walls.
- E. Finish: Factory primed, Field painted.

2.12 SHELF AND RELIEVING ANGLES

- A. Fabricate shelf and relieving angles from steel angles of sizes indicated and for attachment to concrete framing.
 - 1. Provide slotted holes to receive 3/4" bolts, spaced max. 6" from ends and max. 24" o.c., unless otherwise indicated.
- B. For cavity walls, provide vertical channel brackets to support shelf/relieving angles from back-up masonry and concrete.
 - 1. Align expansion joints in angles with indicated expansion joints in cavity wall exterior wythe.
- C. Finish: Factory primed, Field painted..

2.13 LOUVER PROTECTION SCREEN

- A. Furnish and install as detailed where shown on Drawings and described herein.
 - 1. Gymnasium, Lunchroom; Cafeteria, Cafetorium, Media Centers: Furnish and install louver protection screen at each grille or louver located in cafeteria where such louver or grille is below 10'-0" above finished floor.
 - 2. Furnish elsewhere where indicated on drawings.
- B. Perforated steel plate min. 1/8" thick (minimum) x length x width required to fit opening with single screen size.
 - 1. Perforations:
 - a. Egyptian style with minimum of 55% open area.
 - b. No rough edges permitted.
- C. Steel Angle Frame:
 - 1. Provide a 2-1/2" X 2-1/2" X 1/4" steel angle frame continuously around perimeter of perforated plate and another 2-1/2 x 2-1/2 x 1/4" steel angle frame around the perimeter of the opening. Miter and weld corners.
 - 2. Where necessary to accommodate louver specified under mechanical section; provide off set frame.
- D. Screen Stiffeners:
 - 1. Weld 1" x 1/4" steel plates at 12" on center each way at back side of the protection screen, length of plate stiffener to extend the full width and height of the louver.
- E. Finish: Factory primed, Field painted.
 - 1. Paint screen and frame to match wall in which it occurs.
- F. Approved manufacturers subject to conformance with Contract Documents:
 - 1. Ametco Manufacturing Co.
 - 2. Architectural Grille
 - 3. Kees Incorporated
 - 4. McNichols Co.
 - 5. Register and Grille Manufacturing Company., Inc..

2.14 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish metal fabrications after assembly.

2.15 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by hot-dip process comply with following requirements:
 - 1. ASTM A 153 for galvanizing iron and steel hardware.
 - 2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299" thick and heavier.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated.
 - 1. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.
 - 2. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

2.16 ALUMINUM FINISHES

- A. Finish designations prefixed by "AA" conform to system established by Aluminum Association for designating aluminum finishes.
 - 1. Clear Anodized Finish: AA-M12C22A41 (Mechanical Finish: Class I Architectural: clear film thicker than 0.7 mil) complying with AAMA 607.1.
 - a. Nonspecular; Chemical Finish: etched, medium matte; Clear Anodic Coating
 - 2. Colored Anodized Finish: NAAMM AA-C22A42/44, Class I (min. thickness 0.7 mils), integral or electrolytically deposited color anodized finish as follows:
 - a. Provide standard aluminum industry dark bronze color.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors to be embedded in concrete or masonry construction; coordinate delivery of such items to project site.
- B. Center nosings on tread widths with noses flush with riser faces and tread surfaces.
- C. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.02 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, wood screws, and other connectors as required.
 - 1. Where components fastened to masonry walls attach using epoxy set type screws/bolts of type and size indicated or required.
 - 2. Use of toggle bolts or Tapcon type fasteners not acceptable
- B. Cutting, Fitting, and Placement:
 - 1. Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications.
 - 2. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

- C. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints.
 - 1. Weld connections not left as exposed joints, but not shop welded because of shipping size limitations.
 - 2. Do not weld, cut, or abrade surfaces of exterior units hot-dip galvanized after fabrication, and intended for bolted or screwed field connections.
- E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- F. Corrosion Protection: Coat concealed surfaces of aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals with heavy coat of bituminous paint or zinc chromate primer.

3.03 SETTING LOOSE PLATES

- A. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces.
 - 1. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges, or other adjustable devices.
 - 1. After bearing members positioned and plumbed, tighten anchor bolts.
 - 2. Do not remove wedges or shims, but if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 3. Use metallic nonshrink grout in concealed locations where not exposed to moisture; use nonmetallic nonshrink grout in exposed locations, unless otherwise indicated.
 - 4. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 INSTALLATION OF LOUVER PROTECTION SCREENS

- A. Installations:
 - 1. Unless otherwise detailed or noted the face of the louver protection screen to be flush with the face of the wall.
- B. Bolt screen to angle with 3/8" bolts and flat washers at 16" on center, unless noted otherwise.
 - 1. Refer to details.
- C. Attach angle to block with lag screws and expansion shield where secured to solid block and toggle bolts where secured to block cavity.
 - 1. Fasteners to be at 16" on center unless noted otherwise.
- D. Prepare and finish.
 - 1. Grind and sand all edges to eliminate all roughness.
 - 2. Field Paint screen and frame, color to be selected by the Architect.

3.05 INSTALLATION OF METAL BAR GRATINGS

- A. General: Install gratings to comply with recommendations of NAAMM grating standard referenced under Part 2 that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

- B. Secure removable units to supporting members with type and size clips and fasteners indicated, or if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
 - C. Secure nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.
 - D. Install gratings straight, true and square and free of distortions. Top of grate to be flush with surface of adjacent concrete slab or flooring.
 - 1. Provide additional supports necessary to limit deflection to L/360 when subjected to a concentrated load of 300 pounds.
- 3.06 ADJUSTING AND CLEANING
- A. Touch-Up Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.
 - 2. Apply by brush or spray to provide min. dry film thickness of 2.0 mils.

END OF SECTION 05 5000

SECTION 06 1053
MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Types of work in this Section include rough carpentry for:
 - 1. Construction Panels.
 - 2. Roof top equipment bases and support curbs.
 - 3. Wood grounds, nailers and blocking; Wood furring.

1.03 DEFINITIONS

- A. Rough carpentry includes carpentry work not specified as part of other sections and is generally not exposed, except as otherwise indicated.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions for materials listed below:
 - 1. Sheathing; Construction Panels
 - 2. Sheathing; Stage Flooring
- B. Material Certificates:
 - 1. Where dimensional lumber provided to comply with min. allowable unit stresses, submit listing of species and grade selected for each use, and submit evidence of compliance with specified requirements.
 - 2. Compliance may be in form of signed copy of applicable portion of lumber producer's grading rules showing design values for selected species and grade.
 - 3. Design values: Approved by Board of Review of American Lumber Standards Committee.
- C. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storing, installation and finishing of treated material.
 - 1. Preservative Treatment: For each type specified, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained and conformance with applicable standards.
 - 2. For water-borne treatment, include statement that moisture content of treated materials reduced to levels indicated prior to shipment to Project site.
 - 3. Fire-Retardant Treatment: Include certification by treating plant that treated material complies with specified standard and other requirements.

1.05 PRODUCT HANDLING

- A. Delivery and Storage:
 - 1. Keep materials under cover and dry.
 - 2. Protect against exposure to weather and contact with damp or wet surfaces.
 - 3. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.
 - 4. For lumber and plywood pressure treated with waterborne chemicals, sticker between each course to provide air circulation.

1.06 PROJECT CONDITIONS

- A. Coordination:
 - 1. Fit carpentry work to other work; scribe and cope as required for accurate fit.
 - 2. Correlate location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.

PART 2 - PRODUCTS

2.01 LUMBER, GENERAL

- A. Lumber Standards: Manufacture lumber to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
- B. Inspection Agencies: Inspection agencies and abbreviations used to reference with lumber grades and species include following:
 - 1. SPIB - Southern Pine Inspection Bureau.
 - 2. WCLIB - West Coast Lumber Inspection Bureau.
 - 3. WWPA - Western Wood Products Association.
- C. Grade Stamps: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
 - 1. For exposed lumber apply grade stamps to ends or back of each piece, or omit grade stamps entirely and issue certificate of grade compliance from inspection agency in lieu of grade stamp.
 - 2. Nominal sizes are indicated, except as shown by detail dimensions.
 - 3. Provide actual sizes as required by PS 20, for moisture content specified for each use.
 - 4. Provide dressed lumber, S4S, unless otherwise indicated.
 - 5. Provide seasoned lumber with 19% max. moisture content at time of dressing and shipment for sizes 2" or less in nominal thickness, unless otherwise indicated.

2.02 DIMENSION LUMBER

- A. For light framing provide "Stud" or "Standard" grade lumber for stud framing (2" to 4" thick, 2" to 6" wide, 10' and shorter) and "Standard" grade for other light framing (2" to 4" thick, 2" to 4" wide), any species.
- B. For light framing (2" to 4" thick, 2" to 4" wide), provide following grade and species:
 - 1. Standard grade.
 - 2. Southern Pine graded under SPIB rules.
 - 3. Spruce-Pine-Fir graded under NLGA rules.
- C. Treatment: Dimension lumber to be fire retardant treated unless noted otherwise.

2.03 MISCELLANEOUS LUMBER

- A. Provide wood for support or attachment of other work including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members.
- B. Provide lumber of sizes indicated, worked into shapes shown, and as follows:
 - 1. Moisture content: 19% max. for lumber items not specified to receive wood preservative treatment.
 - 2. Grade: Standard Grade light framing size lumber of any species or board size lumber as required.

2.04 CONSTRUCTION PANELS

- A. Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood panels and, for products not manufactured under PS 1 provisions, with American Plywood Associates (APA) "Performance Standard and Policies for Structural-Use Panels", Form No. E445.

- B. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.
- C. Concealed APA Performance-Rated Panels: Where construction panels used for following concealed types of applications, provide APA Performance-Rated Panels complying with requirements indicated for grade designation, span rating, exposure durability classification, edge detail (where applicable) and thickness.
 - 1. Wall Sheathing: APA RATED SHEATHING.
 - a. Material: Plywood.
 - b. Exposure Durability Classification: EXTERIOR.
 - c. Span Rating: As required to suit stud spacing indicated.
 - d. Grade: A/C Plugged
 - e. Thickness: 3/4" unless noted otherwise.
 - 2. Plywood Backing Panels: APA RATED:
 - a. Use: Backboard for mounting telephone and electrical equipment.
 - b. Material: Plywood.
 - c. Treatment: Fire retardant treated.
 - d. Grade: C-D Plugged; Interior glue
 - e. Thickness: 3/4" unless noted otherwise.

2.05 MISCELLANEOUS MATERIALS

- A. Fasteners and Anchorages: Provide size, type, material and finish indicated and recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices.
 - 1. Wood plate and nailers to concrete: Min. 3/8" dia. Tapcon, Molly "Parabolds", or equal, 16" o.c.; predrill wood member 1/16" dia. larger than bolt size.
 - 2. Wood members to metal framing: Min. #8 "Tek's" self-drilling screws, 8" o.c. or 3/8" min. dia. machine bolts 16" o.c.
 - 3. Wood furring or grounds to concrete or masonry: Min. 3/8" dia. flathead Tapcon screws, 8" o.c.
 - 4. Wood members to metal decking: Min. 11-16 x 2-1/4" oval head, type 5 "Tek's" screws, 12" o.c.
 - 5. Wood blocking and nailers to structural steel: Min. 5/8" carriage bolts at max. 24" on center.
 - 6. Where rough carpentry work exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with hot-dip zinc coating (ASTM A 153).
- B. Building Paper: ASTM D 226, Type I; asphalt saturated felt, non-perforated, 15-lb. type.
- C. Building Paper: ASTM D 226, Type II; asphalt saturated felt, non-perforated, 30-lb. type.

2.06 WOOD TREATMENT BY PRESSURE PROCESS

- A. Preservative Treatment: Where lumber or plywood is indicated as "PT" or "Treated," or is specified herein as treated, comply with applicable requirements of AWPB Standards C2 (Lumber) and C9 (Plywood) and of AWPB Standards listed below.
 - 1. Mark each treated item with the AWPB Quality Mark Requirements.
 - 2. Use of arsenic as a component of chemical treatment not acceptable.
- B. Pressure-treat above-ground items with water-borne preservatives to comply with AWPB LP-2.
 - 1. After treatment, kiln-dry lumber and plywood to max. moisture content, respectively, of 19% and 15%.
 - 2. Treat indicated items and following:
 - a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.
 - b. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.
 - c. Wood framing members less than 18" above grade.
 - d. Wood floor plates installed over concrete slabs directly in contact with earth.

- C. Pressure-treat following with water-borne preservatives for ground contact use complying with AWPB LP-22:
 - 1. Wood members in contact with ground.
- D. Complete fabrication of treated items prior to treatment, where possible.
 - 1. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment and to comply with AWPB M4.
 - 2. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
- E. Fire-Retardant Treatment: Where fire-retardant treated wood indicated, pressure impregnate lumber and plywood with fire-retardant chemicals to comply with AWPB C20 and C27, respectively, for treatment type indicated below; identify fire-retardant treated lumber with appropriate classification marking of Underwriters Laboratories, Inc., U.S. Testing, Timber Products Inspection or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire Retardant Type:
 - a. Interior Type A:
 - 1) Use where fire retardant wood for all applications.
 - b. Exterior Type:
 - 1) Use fire retardant wood for applications where wood part of fire rated assemblies.
 - 2) Use of fire retardant lumber for other exterior applications not required.
- F. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Discard units of material with defects which might impair quality of work, and units too small to use in fabricating work with min. joints or optimum joint arrangement.
- B. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.
- C. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.
 - 1. Countersink nail heads on exposed carpentry work and fill holes.
 - 2. Use common wire nails, except as otherwise indicated.
 - 3. Use finishing nails for finish work.
 - 4. Select fasteners of size that do not penetrate members where opposite side exposed to view or will receive finish materials.
 - 5. Make tight connections between members.
 - 6. Install fasteners without splitting of wood; predrill as required.

3.02 FIRE-RETARDENT WOOD

- A. Fire-retardent wood shall be isolated from contact with metal building components through use of a bituminous coating (or other approved method) applied to the wood.

3.03 WOOD GROUNDS, NAILERS, BLOCKING AND SLEEPERS

- A. Provide wherever shown and where required for screeding or attachment of other work.
 - 1. Form to shapes shown and cut as required for true line and level of work attached.
 - 2. Coordinate location with other work involved.
- B. Attach to substrates as required to support applied loading.
 - 1. Countersink bolts and nuts flush with surfaces, unless otherwise indicated.
 - 2. Build into masonry during installation of masonry work.
 - 3. Where possible, anchor to formwork before concrete placement.

3.04 WOOD FURRING

- A. Install plumb and level with closure strips at edges and openings.
 - 1. Shim with wood as required for tolerance of finished work.
 - 2. Firestop furred spaces on walls at each floor level and at ceiling line of top story, with wood blocking or noncombustible materials, accurately fitted to close furred spaces.
- B. Furring to Receive Plywood Paneling:
 - 1. Unless otherwise indicated, provide 1" x 3" furring at 2' o.c., horizontally and vertically.
 - 2. Select furring for freedom from knots capable of producing bent-over nails and resulting damage to paneling.
- C. Furring to Receive Gypsum Drywall: Unless otherwise indicated, provide 1" x 2" furring at 16" o.c., vertically.
- D. Suspended Furring:
 - 1. Provide size and spacing shown, including hangers and attachment devices.
 - 2. Level to tolerance of 1/8" in 10', except 1/4" in 10' for thick-coat plaster work.

3.05 INSTALLATION OF CONSTRUCTION PANELS

- A. General: Comply with applicable recommendations contained in Form No. E 30F, "APA Design/Construction Guide - Residential & Commercial," for types of plywood products and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Sheathing: Nail to framing.
 - 2. Plywood Backing Panels: Nail to supports.
- C. Wall Sheathing: Where indicated install wall sheathing in accordance with following:
 - 1. On Metal Studs: Screw attach at 8" on center at each support.
- D. Telephone Back Board:
 - 1. Provide a minimum of two separate telephone back boards in locations shown on Electrical Drawings; If not shown as directed by Architect.
 - 2. Unless noted otherwise backboards to be 3/4" thick plywood; 8'-0" x 8'-0", mounted on face of wall at 8" above finished floor.
 - a. Attach to wall with 1/4" toggle bolts at 1'-0" on center along perimeter of plywood.
 - b. Field paint back board with primer and two coats of black paint.
- E. Computer Back Board:
 - 1. Provide a minimum of two separate computer back boards in locations shown on Electrical Drawings; If not shown as directed by Architect.
 - 2. Unless noted otherwise backboards to be 3/4" thick plywood; 8'-0" x 8'-0", mounted on face of wall at 8" above finished floor.
 - a. Attach to wall with 1/4" toggle bolts at 1'-0" on center along perimeter of plywood.
 - b. Field paint back board with primer and two coats of black paint.

END OF SECTION 06 1053

**SECTION 07 1113
BITUMINOUS DAMPPROOFING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of each type of dampproofing work indicated on drawings.
- B. Following types and applications of work specified in this Section:
 - 1. Cold-applied asphalt emulsion dampproofing in the following locations:
 - a. Cavity Walls; On cavity face of block.
 - b. Elsewhere where dampproofing is specified to be installed.
- C. Similar work used as exposed finish excluded by definition and, if required, specified as waterproofing, vapor retarder, roofing, flooring, special coating or other appropriate category.

1.03 QUALITY ASSURANCE

- A. General:
 - 1. For each type of work, obtain primary materials from single manufacturer, to greatest extent possible.
 - 2. Provide secondary materials only as recommended by manufacturer of primary materials.
- B. Installer Qualifications: Firm specialized for min. three years in installation of types of dampproofing required for Project and acceptable to manufacturer of primary materials.
- C. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Submit manufacturer's technical product data, installation instructions, and general recommendations for each dampproofing material required.
 - 2. Include data substantiating that materials comply with specified requirements.

1.05 JOB CONDITIONS

- A. Substrate: Proceed with dampproofing work only after substrate construction and penetrating work completed.
- B. Weather: Proceed with dampproofing work only when existing and forecasted weather conditions permit work performed in accordance with manufacturer's recommendations.
 - 1. Do not dampproofing work when temperature 40°F and falling.
- C. Ventilation: Provide adequate ventilation to prevent accumulation of hazardous fumes during application of solvent-based components in enclosed spaces, and maintain ventilation until coatings thoroughly cured.

1.06 CERTIFICATIONS

- A. Provide certification that the material is 100% asbestos free.

PART 2 - PRODUCTS

2.01 BITUMINOUS DAMPPROOFING MATERIALS

- A. General:
 - 1. Provide bituminous dampproofing materials which comply with following requirements, or provide other similar products certified in writing by manufacturer of primary dampproofing materials as superior in performance for application indicated.
- B. Cold-Applied Asphalt Emulsion Dampproofing:
 - 1. Asphalt Emulsion: Manufacturer's standard asphalt and water emulsion coating, recommended for above or below-grade exterior and for above-grade interior applications to either damp (green) or dry substrates, compounded to penetrate substrate and build to moisture resistant coating.
 - a. Provide semi-fibrated type semi-mastic; brush or trowel grade; asbestos-free emulsion; ASTM D 1227, containing non-asbestos fibrous reinforcement and filler materials.
 - b. Dampproofing Type:
 - 1) Spray Application: Type II
 - 2) Troweled or Brushed Type: Type III
 - 2. Manufacturer: Subject to compliance with requirements, provide asphalt emulsion products of one of following:
 - a. Celotex Corporation.
 - b. Certaineed Corporation.
 - c. Genstar Roofing Products Company.
 - d. J. & P. Petroleum Products, Inc.
 - e. Karnak Chemical Corporation.
 - f. Koppers Company, Inc.
 - g. Manville Building Products Corp.
 - h. Sonneborne Bldg. Products/Rexnord Chemical Products Inc.
 - i. Tamko Asphalt Products, Inc.
 - j. Tremco Company.
 - k. W.R. Meadows, Inc.
- C. Miscellaneous Materials:
 - 1. Bituminous Grout: ASTM D 147.
 - 2. Plastic Cement: ASTM D 491, asphalt base, except provide coal-tar base where specifically recommended by manufacturer of bituminous dampproofing materials.

PART 3 - EXECUTION

3.01 GENERAL

- A. Upon completion of installation of materials specified herein, the contractor shall request that the Architect view installation:
 - 1. Provide minimum of 72 hours advanced notice of intent to request field observation.
- B. The Architect **SHALL** be permitted to view dampproofing prior to this material being concealed.
 - 1. No materials specified herein shall be concealed without the Architect having viewed said material.
 - 2. Should the Contractor conceal materials specified herein, prior to the Architect viewing said materials, the contractor shall remove finish materials as necessary for Architect to ascertain that dampproofing materials were installed properly.
 - a. The cost of demolition and replacement of finished materials necessary for viewing of dampproofing shall be at no additional cost to the contract.

3.02 SCHEDULING

- A. Schedule application of dampproofing so that the installation of rigid cavity insulation and laying of brick occur within no more than thirty (30) days of the date of application of the dampproofing.

3.B. PREPARATION OF SUBSTRATE

- C. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.
- D. Prepare surface: Prepare surface of block by performing the following work:
 - 1. Clean surface of block.
 - 2. Remove all excess mortar and grout from surface of wall to obtain a smooth uniform surface.
 - 3. Remove all mortar droppings.
 - 4. Remove all other debris and material which interfere with proper installation of dampproofing.
 - 5. Fill and seal all penetrations through face of masonry.
 - 6. Fill holes in face of masonry.
 - 7. Point-up all mortar joints to eliminate cracks, gaps or other openings in mortar and to provide a smooth, solid, dense surface.
 - 8. Install flashing over beams, columns, pipes or other materials which penetrate cavity face of block wall.
- E. Install cant strips and similar accessories shown and as recommended by prime materials manufacturer even if not shown.
- F. Fill voids, seal joints, and apply bond breakers (if any) as recommended by prime materials manufacturer, with particular attention at construction joints.
- G. Install separate flashings and corner protection stripping as recommended by prime materials manufacturer, where indicated to precede application of dampproofing.
 - 1. Comply with details shown and manufacturer's recommendations.
 - 2. Give particular attention to requirements at building expansion joints, if any.
- H. Prime substrate as recommended by prime materials manufacturer.

3.03 INSTALLATION

- A. General: Comply with manufacturer's instructions, except where more stringent requirements shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of work.
- B. Apply Dampproofing as follows:
 - 1. Apply coat of semi-fibrated, semi-mastic, asphalt emulsion dampproofing materials using a two coat application procedure.
 - a. The first coat to be sprayed-on.
 - b. The second to be troweled or brushed-on.
 - c. Application rate: Total application rate to be a minimum of 5.0 gal. per 100 sq. ft..
 - d. Min. finished thickness: Dry film thickness of a minimum of 62 mils (1/16").
 - 2. Coat outer face of inner wythe of new masonry exterior walls with dampproofing. Dampproofing shall fully cover entire face of cavity walls and shall be free of holidays, voids or gaps and shall be of sufficient thickness to prevent bleed through of natural color of block.

3.04 DETERIORATION OF COATING

- A. Where dampproofing has faded in color, deteriorated due to moisture or water, or where coverage has in any way been lessened or damaged, the contractor shall re-apply dampproofing to thickness indicated.

3.05 PROTECTION

- A. Protection of Other Work:
 - 1. Do not allow liquid and mastic compounds to enter and clog drains and conductors.
 - 2. Prevent spillage and migration onto other surfaces of work, by masking or otherwise protecting adjoining work.

- B. Do not allow dampproofing to get on portion of masonry wall ties that protrude into brickwork; remove any that does get on this part of wall tie.
- C. Exercise care in application in order to protect exposed work.
 - 1. Where exposed surfaces become coated or smeared, thoroughly clean and remove dampproofing without damage to surface.
 - 2. Replace materials damaged due to attempts at removal, without cost to Owner.

END OF SECTION 07 1113

**SECTION 07 2100
THERMAL INSULATION**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

- A. Extent of insulation work shown on drawings and indicated by provisions of this Section.
- B. Applications of insulation specified in this Section include following:
 - 1. Board-type cavity wall insulation.
 - a. Referred to on drawings as "Rigid cavity Insulation".
 - b. Install on face of block in exterior cavity wall construction and elsewhere where shown on drawings.
 - 2. Blanket-type building insulation.
 - a. Referred to on drawings as "Building Insulation", "Blanket Insulation" or "Batt Insulation".
 - b. Install above suspended ceilings, fire rated assemblies, and elsewhere where indicated.
- C. Semi-Rigid, Semi Refractory, Fire Safing Insulation specified in Division 7 section, Fire-Stopping.
- D. Thermal insulation installed with z-furring members specified in Division- 9 section "Gypsum Drywall".

1.03 QUALITY ASSURANCE

- A. Thermal Resistivity:
 - 1. Where thermal resistivity properties of insulation materials designated by r-values they represent rate of heat flow through homogeneous material exactly 1" thick, measured by test method included in referenced material standard or otherwise indicated.
 - 2. Properties expressed by temperature difference in degrees F between two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.
- B. Fire Performance Characteristics:
 - 1. Provide insulation materials identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is part, determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Surface Burning Characteristics: ASTM E 84.
 - b. Fire Resistance Ratings: ASTM E 119.
 - c. Combustion Characteristics: ASTM E 136.
- C. Max. Allowable Content of Inorganic Insulations: Provide insulations composed of mineral fibers or mineral ores which contain no asbestos of any type or mixture of types occurring naturally as impurities as determined by polarized light microscopy test per Appendix A of 40 CFR 763.
- D. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product literature and installation instructions for each type of insulation and vapor retarder material required.

- B. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including r-values (aged values for plastic insulations), densities, compression strengths, fire performance characteristics, perm ratings, water absorption ratings and similar properties.
 - 1. For fire safeing materials, submit manufacturer data showing applicable U.L. Design numbers.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow.
 - 1. Comply with manufacturer's recommendations for handling, storage and protection during installation.
- B. Protection for Plastic (rigid board) Insulation:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment. Materials subjected to prolonged exposure to be replaced with new.
 - 2. Protect against ignition at all times.
 - 3. Do not deliver plastic insulating materials to project site ahead of installation time.
 - 4. Complete installation and concealment of plastic materials rapidly as possible in each area of work.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of following:
 - 1. Manufacturers of Extruded Polystyrene Board Insulation:
 - a. Amoco Foam Products Co.
 - b. Dow Chemical U.S.A.
 - c. Minnesota Diversified Products, Inc.
 - d. UC Industries.
 - 2. Manufacturers of Glass Fiber Insulation; Building Insulation:
 - a. CertainTeed Corp.
 - b. Knauf Fiber Glass.
 - c. Owens-Corning Fiberglas Corp.
 - d. Johns Manville

2.02 INSULATING MATERIALS

- A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.
- B. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths and lengths.

2.03 EXTRUDED POLYSTYRENE BOARD INSULATION

- A. Extruded Polystyrene Board Insulation: Rigid, cellular thermal insulation with closed-cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for Type indicated; with 5-year aged r-values of 5.4 and 5 at 40°F and 75°F (4.4°C and 23.9°C), respectively; and as follows:
 - 1. Type IV, 1.6 lb./cu. ft. min. density, unless otherwise indicated.
- B. Surface Burning Characteristics: Max. flame spread and smoke developed values of 5 and 165, respectively.
- C. Thickness: Thicknesses of rigid cavity insulation to be as follows:
 - 1. Rigid Cavity Insulation: 1-1/2" Unless noted.
- D. Size: Size of rigid board insulation to be as follows:
 - 1. Rigid Cavity Insulation: 1'-4" X 8'-0"; Unless noted.

2.04 BLANKET-TYPE BUILDING INSULATING MATERIAL

- A. Unfaced Mineral Fiber Blanket/Batt Insulation: Formaldehyde-free thermal 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); and as follows:
1. Mineral Fiber Type: Fibers manufactured from glass or slag.
 - a. Combustion Characteristics: Passes ASTM E 136 test.
 - b. Surface Burning Characteristics: Max. flame spread and smoke developed values of 25 and 50, respectively.
 2. Location of Use:
 - a. Install where voids or gaps are indicated to be filled with insulation and elsewhere where indicated on drawings.
 - b. Where multiple layers of insulation required, the second (outer) layer to be unfaced.
- B. Poly Encapsulate-Faced Mineral Fiber Blanket/Batt Insulation: **Class-A** rated formaldehyde-free thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 655 for Type II, Class C (blankets without flame spread rating); Four (4) sided poly encapsulated blankets with a 0.5 per vapor-retarder membrane on one face, respectively; and as follows:
1. Mineral Fiber Type: Fibers manufactured from glass or slag.
 2. Minimum "R" Value; Insulation to have "R" values as follows:
 - a. Ceilings: R-19
 - b. Exterior Walls 4" Studs: R-11
 - c. Exterior Walls 6" Studs: R-19
 3. Location of Use: For use in walls and above ceilings only where facing fully concealed by and in direct contact with wall and/or ceiling finish where such wall and/or ceiling finish has a flame spread of less than 25 and smoke developed of less than 450. Use of kraft face insulation not permitted where face of insulation not in direct contact with ceiling or wall finish.
- C. FSK-Faced Mineral Fiber Blanket/Batt Insulation: Formaldehyde-free thermal thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 655 for Type III, Class A (blankets with reflective vapor-retarder membrane facing with flame spread of 25 or less); foil-scrim-kraft vapor-retarder membrane on one face, respectively; and as follows:
1. Mineral Fiber Type: Fibers manufactured from glass or slag.
 2. Combustion Characteristics: Unfaced blanket/batt passes ASTM E 136 test.
 3. Surface Burning Characteristics: Max. flame spread and smoke developed values of 25 and 50, respectively.
 4. Minimum "R" Value: To match kraft face insulation for type of application.
 5. Location of Use: For use in walls and above ceilings where insulation exposed, where face of insulation not in direct contract with wall board or ceiling board, and where part of fire rated assembly.

2.05 MISCELLANEOUS MATERIALS

- A. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung.

2.06 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer, and complying with requirements for fire performance characteristics.
- B. Mechanical Anchors: Type and size indicated or, if not indicated, as recommended by insulation manufacturer for type of application and condition of substrate.
- C. Eave Ventilation Troughs: Preformed rigid fiberboard or plastic sheet designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.
- D. Crack Sealer for Board Insulation: Provide polymeric insulating foam in aerosol dispenser designed for filling voids in board insulation.
1. Product: Subject to compliance with requirements, provide Construction Products Div., W.R. Grace &

Co., "Polycel 100".

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

- A. Installer examine substrates and conditions under which insulation work performed.
 - 1. Satisfactory substrate one that complies with requirements of section in which substrate and related work specified.
 - 2. Installer provide written report listing conditions detrimental to performance of work in this Section.
 - 3. Do not proceed with installation of insulation until unsatisfactory conditions corrected.
- B. Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections which might puncture vapor retarders.

3.02 INSTALLATION, GENERAL

- A. Comply with manufacturer's instructions for particular conditions of installation in each case.
 - 1. If printed instructions not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
- B. Extend insulation full thickness shown over entire area insulated.
 - 1. Cut and fit tightly around obstructions, and fill voids with insulation.
 - 2. Remove projections which interfere with placement.
- C. Apply single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.
- D. Continuity of Insulation System: Install wall and roof insulation systems in a manner to maintain uninterrupted continuity of insulation envelope system.
 - 1. The intent of the insulation is to create an uninterrupted building envelope capable of resisting the transfer of heat from one side of the envelope to the other. The contractor shall be responsible for furnishing all materials and labor necessary to install the insulation building envelope.
 - 2. Install wall insulation full height and length of exterior walls.
 - 3. Install ceiling/roof insulation full length and width of building.
 - 4. Provide additional insulation at transition from wall to ceiling/roof as necessary, indicated or required to maintain continuity of the insulation system.
 - 5. Where insulation placed at ceiling or sub ceiling and levels of ceiling or sub ceiling vary, provide insulation in vertical wall or partition from lower ceiling or sub ceiling to upper ceiling or sub ceiling as required to maintain the continuity of the insulation system.

3.03 INSTALLATION OF RIGID CAVITY-WALL INSULATION:

- A. Rigid Cavity Insulation: Insulate exterior cavity walls and other areas where shown on drawings by installing specified insulation on cavity side of inner wythe.
 - 1. Bring insulation up completely to elevations indicated for underside of bond beams, lintels, through-wall flashing, and similar interruptions through cavity before installing these items.
- B. Condition of Surfaces:
 - 1. Wall surfaces of cavities against which insulation applied: Clean and dry.
 - 2. Check surfaces for protruding mortar, concrete, or other obstacles that may interfere with installation of insulation.
 - a. Remove such obstacles, if present, before applying insulation.
- C. Apply insulation directly to masonry by use of plastic cement, portland cement, approved wall ties, or approved mechanical fasteners recommended by insulation manufacturer.
- D. On units of plastic insulation, install small pads of adhesive spaced approximately 1'-0" o.c. both ways on inside

face.

1. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways.
2. Press units firmly against inside wythe of masonry or other construction as shown.
3. **DO NOT** rely on friction from wall ties to hold insulation in place.

E. Cut insulation to fit neatly against adjoining surfaces and apply in parallel courses with joints breaking midway over course below.

1. Apply insulation in contact with adjoining units without forcing.
2. Fit joints tightly.
3. Use of nails or other methods of attachment which will damage damp proofing are not acceptable.

F. Seal joints between closed-cell (non-breathing) insulation units by applying mastic or sealant to edges of each unit to form tight seal as units shoved into place.

1. Fill voids in completed installation with mastic or sealant.

3.04 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations.

1. If no specific method indicated use mechanical anchorage to provide permanent placement and support of units.
2. Provide all material necessary for proper installation and support of insulation to prevent sagging, loose joints, and pulling of fiberglass away from vapor barrier.

B. Apply insulation in a manner so as not to reduce the overall thickness and the insulating value of the insulation.

1. Avoid compression of insulation.

C. Ceiling Insulation: Ceiling insulation to be loosely laid with adjacent sections tightly abutted.

1. Where domestic water or sprinkler piping exist, run insulation over the top of the piping in a manner that insures that the piping is within the Insulated space.

D. Wall Insulation: Wall insulation to be of size to match stud spacing.

1. Install insulation in between stud, full height and width of opening, using single pieces only.
2. Extend flange on vapor barrier across face of stud in order to maintain integrity of vapor barrier.
3. Secure insulation flange to stud at 12" on center.

E. Set vapor retarder faced units with vapor retarder to warm side of construction, except as otherwise indicated.

1. Do not obstruct ventilation spaces, except for fire stopping.
2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure air-tight installation.

F. Set reflective foil-faced units accurately with air space in front of foil as shown.

1. Provide min. 3/4" air space where possible.

G. Coordination with electrical and mechanical equipment: Where electrical equipment and fixtures or mechanical equipment are recessed in ceilings where insulation is specified to be installed, hold insulation back from edge of device a minimum of 3".

1. **DO NOT** place insulation over recessed mechanical or electrical equipment unless specifically noted otherwise.

3.05 INSTALLATION OF FIRE RATED INSULATION

A. Comply with requirements for installation of general building insulation.

B. Fire rated insulation: Insulation installed over fire rated ceilings or in fire rated walls or spaces (plenums) shall be fire rated and shall have facing suitable for maintaining required rating.

3.06 INSTALLATION OF LOOSE INSULATION FILL

- A. Place loose glass insulation into spaces and onto surfaces as shown, either by pouring or by machine-blowing.
- B. Level horizontal applications to uniform thickness indicated, lightly settled to uniform density, but not excessively compacted.
- C. Stuff loose glass fiber insulation into miscellaneous voids and cavity spaces where shown.
 - 1. Compact to approximately 40% of normal max. volume (to density of approximately 2.5 lbs. per cu. ft.)

3.07 EAVE VENTILATION TROUGHS

- A. Install eave ventilation troughs between all structural members (rafters) as necessary to ensure that a minimum of 8" clear ventilation is provided between top of trough and underside of roof deck.

3.08 PROTECTION

- A. General: Protect installed insulation and vapor retarders from harmful weather exposures and from possible physical abuses, where possible by non delayed installation of concealing work or, where not possible, by temporary covering or enclosure.
 - 1. In areas where insulation to remain exposed, where vapor barrier is damaged due to construction activities replace with new. Field patches not acceptable.

END OF SECTION 07 2100

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes work associated with Modified Bitumen Roofing System, Section 07533, masonry walls and other related work not part of metal roofing and wall panels and includes the following:
 - 1. Metal counter flashing; and base flashing (if any).
 - 2. Metal wall flashing and expansion joints.
 - 3. Built-in metal valleys, gutters and scuppers.
 - 4. Elastic/Elastomeric flashing.
 - 5. Exposed metal trim/fascia units.
 - 6. Miscellaneous sheet metal accessories.
 - 7. Elastomeric secondary flashing system for use with sheet metal flashings.
- B. Integral masonry flashings specified as masonry work in sections of Division 4.
- C. Metal gutters, downspouts, and trim for metal roofing and wall panels specified in Division-7 section Pre-Formed Roofing and Siding.
- D. Roof accessory units of pre-manufactured, set-on type specified in Division 7 Section "Roof Accessories".

1.03 SUBMITTALS

- A. Product data: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.
- B. Samples: Submit two each of following:
 - 1. Manufacturer's standard color line for Architect's selection of colors for factory or shop finished items.
 - 2. 8" square samples of specified sheet materials exposed as finished surfaces.
 - 3. 12" long samples of factory-fabricated products exposed as finished work, complete with specified factory finish.
- C. Shop Drawings:
 - 1. Show layout, profiles, methods of joining, and anchorages details, including major counter-flashings, trim/fascia units, gutters, downspouts, scuppers and expansion joint systems.
 - 2. Provide layouts at 1/4" scale and details at 3" scale.

1.04 QUALITY ASSURANCE

- A. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.
- B. Producer's Statement of Applicability: Submit from manufacturer or other producer, a written-certified statement that producer reviewed proposed application of product on Project.
 - 1. Statement shall state that producer agrees with or does not object to Architect's specification and Contractor's selection of product for use in Work.
 - 2. Statement also state that proposed application of product on project is suitable and proper.

- C. Qualifications of Installers: Provide at least one person, present at all times during execution of the work of this section, who shall be thoroughly trained and experienced in materials and methods required and who shall direct the entire flashing and sheet metal fabrication and installation.
 - D. Codes and Standards: In addition to complying with applicable codes and regulations, comply with recommendations contained in 'Architectural Sheet Metal Manual', latest edition, of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).
 - E. FM Listing: Provide roofing system and component materials which have been evaluated by Factory Mutual System for fire spread, wind-uplift and hail damage and are listed in 'Factory Mutual Approval Guide' for Class I Construction.
 - 1. Provide roof covering materials bearing FM approval marking on bundle, package or container, indicating that the material has been subjected to FM's examination and follow-up service.
 - 2. Installation, including anchorage, to meet requirements of FM-I-75 wind load classification with FM 129S perimeter installation. Provide test data verifying compliance.
 - F. Building Code Compliance: Roofing system, including edge securement, to comply with applicable sections of current International Building Code and Standard Building Code of Georgia.
 - 1. Edge metal installation shall comply with provisions of Section 1504.5 "Edge Securement for low-sloped Roofs" of the Standard Building Code of Georgia.
 - 2. Low-slope membrane roof system metal edge securement, except gutters, shall be designed and installed for wind loads in accordance with Chapter 16, except that the basic wind shall be determined from Figure 1609.
 - 3. Design, fabrication, installation and testing of edge metal shall meet ANSI/SPRI ES-1 standards.
- 1.05 PRODUCT HANDLING:
- A. Protection: Use all means necessary to protect flashing and sheet metal materials before, during and after installation and to protect the installed work and materials of other trades.
 - 1. Stack preformed materials to prevent twisting, bending, or abrasion and in a manner to ensure adequate ventilation.
 - 2. Prevent contact with material or metals during storage which may cause discoloration or staining.
- 1.06 WARRANTIES
- A. Manufacturer's Product Warranty: For factory or shop finished fabrications, provide paint manufacturer's twenty (20) year guarantee against fading, cracking, peeling, blistering or wear-thru of paint film.
 - B. Installer's Warranty: Furnish to Owner a guarantee covering maintenance of products herein specified for a period of two (2) years from date of final acceptance. Within warranty period, replace or correct any defective materials or workmanship without cost to owner.
- 1.07 PROJECT CONDITIONS
- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation.
 - 1. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide flashings and sheet metal designed and fabricated to fit applications indicated and to perform optimally with respect to weather resistance, water tightness, durability, strength, and uniform appearance.
- B. Expansion provisions: Fabricate flashings and sheet metal to allow controlled expansion in running lengths not only for movement of metal components in relationship to one another but also to adjoining dissimilar materials, including flashing and roofing membrane materials, in manner sufficient to prevent water leakage, deformation or damage.

- C. Copings, fascia, edge metals and other similar materials to be furnished and warranted, as part of roof system warranty, by roof system manufacturer.
 - 1. Copings, fascia and edge metals to be tested by FM and shall be approved for listed uplift.

2.02 MATERIALS

- A. Zinc-Coated Steel: Commercial quality with 0.20 percent copper, ASTM A 526 except ASTM A 527 for lock-forming, G90 hot-dip galvanized, mill phosphatized for painting where indicated;
 - 1. Thickness: Minimum 0.0359 inch thick (20 gage) except as otherwise indicated.

2.03 METAL FINISHES

- A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated.
 - 1. For components assembled or welded in factory, apply finish after fabrication completed.
- B. Provide colors or color matches as indicated or, if not indicated, selected by Architect from manufacturer's standard colors.
 - 1. Colors selected for products of this section match the colors selected for the metal siding and roofing specified in Division-7 Section; Pre-Formed Metal Roofing and Siding.
- C. Fluorocarbon Coating: Inhibitive thermo-cured primer, 0.2 min. mil. dry film thickness, and thermo-cured fluorocarbon coating containing "Kynar 500" resin, 1.0 mil. min. dry film thickness.

2.04 ELASTOMERIC FLASHING

- A. Water and Ice Shield: Smooth surfaced peel and stick membrane for use as a secondary waterproofing membrane.
 - 1. Application: For use under all metal flashings, including, but not limited to, rake trim, fascias, ridge caps, valleys, vertical wall flashings, cap flashings, copings and expansion joints covers.
 - 2. Thickness: 40 Mil min.
- B. Approved manufacturers subject to compliance with technical provisions of the contract:
 - 1. GAF Leak Barriers
 - 2. MiraDri, WIP 200 Non Skid Film Surface
 - 3. Owens Corning WeatherLock Self-sealing Ice and Water Barrier
 - 4. W.R. Grace Ice and Water Shield

2.05 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Solder: Provide 60-40 tin/lead solder (ASTM B32), with acid-chloride type flux, except use resin flux over tinned surfaces.
- B. Lead Flashing: ASTM B 749, Type L51121, copper-bearing sheet lead, minimum 4 lbs./sq. ft. (0.0625-inch thick) except not less than 6 lbs./sq. ft. (0.0937-inch thick) for burning (welding) unless otherwise indicated
- C. Fasteners: Same metal as flashing/sheet metal or, other non-corrosive metal as recommended by sheet manufacturer; match finish of exposed heads with material being fastened.
- D. Bituminous Coating: SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
- E. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non-drying, nonmigrating sealant.
- F. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants specified in Division 7 Section "Joint Sealers."
- G. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal

manufacturer for exterior/interior nonmoving joints including riveted joints.

- H. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.
- I. Paper Slip Sheet: 5-lb. rosin-sized building paper.
- J. Polyethylene Underlayment: Min. 6-mil carbonated polyethylene film; resistant to decay when tested in accordance with ASTM E 154.
- K. Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated, noncorrosive.
- L. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.
- M. Gutter and Conductor-Head Guards: 20-gage bronze or nonmagnetic stainless steel mesh or fabricated units, with selvaged edges and noncorrosive fasteners; select materials for compatibility with gutters and downspouts.
- N. Gutter Leaf Guards: Expanded metal guards of size required by gutter to prevent leaves or other foreign materials from entering gutter and as follows:
 - 1. Width: +/- 5"; coordinate with gutter size.
 - 2. Length: Min. 4'-0"; coordinate with gutter supports.
 - 3. Material: Aluminum.
 - 4. Type: Hinged
- O. Elastic Flashing Filler: Closed-cell polyethylene or other soft closed cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with min. stress on flashing sheet.
- P. Roofing Cement: ASTM D 2822, asphaltic.

2.06 METAL FABRICATION

- A. General: Shop-fabricate work to greatest extent possible.
 - 1. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices.
 - 2. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of work.
 - 3. Form work to fit substrates.
 - 4. Comply with material manufacturer instructions and recommendations for forming material.
 - 5. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
 - 6. Fabricate sections to true uniform lines without overstressing or splitting metal and without marring exposed surfaces.
- B. Seams:
 - 1. Fabricate non-moving seams in sheet metal with flat-lock seams.
 - 2. For metal other than aluminum, tin edges seamed, form seams, and solder.
 - 3. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.
- C. Transitions, corners, and intersections of copings shall be one piece all soldered sections.
- D. Formed Profiles: Joints for formed profiles, including but not limited to, expansion joint caps, gravel stops, counter flashings, ect., shall be butt joints (min. 1/8" to 1/4" max. separation) with concealed backup plates formed to exact profile of sheet metal component.
- E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work not used, or not sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, min. 1" deep, fill with mastic

sealant (concealed within joints).

- F. Sealant Joints: Where movable, non-expansion type joints indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- G. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation recommended by manufacturer/fabricator.

2.07 SHEET METAL FLASHING AND TRIM MATERIALS

- A. This section includes various types of metal flashings, including but not limited to: cap flashing, counter flashing, vertical wall flashings and other flashings not specifically addressed elsewhere.
- B. Flashings to be fabricated of minimum 10'-0" lengths of manufacturer's standard pre-formed sections and in accordance with the following:
 - 1. Shape and Size: As detailed and required
 - 2. Thickness: Min. 0.0239 thick (24 gage)
 - 3. Material: Zinc coated metal
 - 4. Finish: "Kynar" finish
 - 5. Color: Color selected by Owner/Architect

2.08 ELASTIC EXPANSION JOINTS

- A. General: Provide factory-fabricated units of size and profile indicated, complete with prefabricated corner units, intersection units and splicing materials.
 - 1. Provide complete with elastic sheet flashing forming primary joint membrane, in supported, "bellows" arrangement designed for securement to both sides of expansion joints.
 - 2. Insulate underside of bellows with adhesively applied, flexible, closed-cell rubber or plastic, min. 3/8" thick.
- B. Type: Metal flanged edges, 3" to 4" wide, formed to profiles indicated to fit curbs, and designed for nailing to curb substrate.
 - 1. Provide metal flanges of one of the following in thicknesses listed:
 - a. Zinc-coated steel: 0.0179" (26 gage).
 - b. Aluminum: 0.032".
- C. Looped Bellows Width: 5" to 6", exclusive of flanges.

2.09 METAL FASCIA

- A. Fascia to be fabricated of minimum 10'-0" lengths of manufacturer's standard pre-formed sections and in accordance with the following:
 - 1. Shape and Size: Shape and Size indicated
 - 2. Thickness; Less than 8" high: Minimum 0.0239 inch thick (24 gage).
 - 3. Thickness; Greater than 8" high: Minimum 0.0359 inch thick (20 gage).
 - 4. Material: Zinc coated metal
 - 5. Finish: "Kynar" finish
 - 6. Color: Color selected by Owner/Architect

2.10 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of following:
- B. Elastic Expansion Joints:
 - 1. Afco Products, Inc.
 - 2. Celotex Corporation/Roofing Products Division
 - 3. BF Goodrich Construction Products
 - 4. Manville/Roofing Systems Division.
 - 5. Phoenix Building Products
 - 6. York Manufacturing, Inc.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual".
 - 1. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level indicated.
 - 2. Install work with laps, joints and seams permanently watertight and weatherproof.
- B. Underlayment: Where stainless steel or aluminum installed directly on cementitious or wood substrates, install slip sheet of red rosin paper and course of polyethylene underlayment.
- C. Bed flanges of work in thick coat of bituminous roofing cement where required for waterproof performance.
- D. Install reglets to receive counter flashing in manner and by methods indicated.
 - 1. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections.
 - 2. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.
- E. Secondary flashing system: Provide and install secondary flashing system of elastomeric flashing (ice and water shield) below all metal flashings installed as part of this section.
- F. Install counter flashing in reglets, either by snap-in seal arrangement, or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.
- G. Install elastic flashing in accordance with manufacturer's recommendations.
 - 1. Where required, provide for movement at joints by forming loops or bellows in width of flashing.
 - 2. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing.
 - 3. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.
- H. Nail flanges of expansion joint units to curb nailers, at max. spacing of 6" o.c.
 - 1. Fabricate seams at joints between units with min. 3" overlap, to form a continuous, waterproof system.

3.02 FLASHINGS

- A. Adjacent sections of flashing shall be lapped a minimum of 4" in the direction of water flow. Laps shall be sealed water tight with a 2" wide bed of sealant compressed between two (2) surfaces.
- B. Flashing shall be secured to structure with nails at 4" on center. All fastener heads shall be sealed watertight with plastic cement.

3.03 CORROSION PREVENTION

- A. Apply Bituminous Paint to aluminum surfaces before placing in contact with masonry, concrete or other corrosive material.
- B. Separate dis-similar materials using one of the following methods:
 - 1. One (1) layer of 30# asphalt impregnated felt.
 - 2. One (1) coat of heavy bodied bituminous paint.
 - 3. Good quality caulking.
 - 4. A non-absorptive tape or gasket.

3.04 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.
- B. Protection: Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure work without damage or deterioration, other than natural weathering at time of Final Acceptance.

END OF SECTION 07 6200

**SECTION 07 7200
ROOF ACCESSORIES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

- A. Extent and locations of roof accessories indicated on drawings and by provisions of this Section.
- B. Types of units specified in this Section include following:
 - 1. Prefabricated curb and equipment support units.
- C. Refer to roofing system sections of these specifications for roofing accessories built into roofing system (not work of this section).

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, rough-in diagrams, details, installation instructions and general product recommendations.
- B. Samples: Submit 2 samples, min. 8" square, of each exposed metal and plastic sheet materials, and 2 samples, min. 24" long, of formed or extruded exposed metal member; color and finish as specified.
- C. Coordination Drawings:
 - 1. Submit coordination drawings for items interfacing with or supporting mechanical or electrical equipment, ductwork, piping, or conduit.
 - 2. Indicate dimensions and locations of items provided under this Section, together with relationships and methods of attachment to adjacent construction and to mechanical/electrical items.

1.04 QUALITY ASSURANCE

- A. Standards:
 - 1. Comply with SMACNA "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap-flashing to coordinate with type of roofing indicated.
 - 2. Comply with "NRCA Roofing and Waterproofing Manual" details for installation of units.
- B. Certificate of Compliance: Submit, as part of Shop Drawings, certification from manufacturer of product or materials furnished herein, stating that product(s) and / or material (s) being furnished comply with technical provisions contained herein.
 - 1. Any and all deviations from technical provisions of specifications shall be specifically noted.

PART 2 - PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS

- A. Provide manufacturers' standard units, modified as necessary to comply with requirements; shop fabricate each unit to greatest extent possible.

2.02 MATERIALS, GENERAL

- A. Zinc-Coated Steel: Commercial quality with 0.20 percent copper, ASTM A 525, G90 hot-dip galvanized, mill phosphatized.

- B. Aluminum Sheet : ASTM B 209, alloy 3003, temper required for forming and performance; AA-C22A41 clear anodized finish, except prepared mill finish where field painting indicated.
 - C. Extruded Aluminum: Manufacturer's standard extrusions of sizes and general profiles indicated, alloy 6063-T52; 0.078" min. thicknesses for primary framing and curb member legs, 0.062" for secondary legs; AA-C22A41 clear anodized finish on exposed members, except as otherwise indicated.
 - D. Insulation: Manufacturer's standard rigid or semi-rigid board of glass fiber of thicknesses indicated.
 - E. Wood Nailers: Softwood lumber, pressure treated with water-borne preservatives for above-ground use, complying with AWPB LP-2; min. 1-1/2" thick.
 - F. Fasteners:
 - 1. Same as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal recommended by manufacturer.
 - 2. Match finish of exposed fasteners with finish of material being fastened.
 - 3. Where removal of exterior exposed fasteners affords access to building, provide nonremovable fastener heads.
 - G. Gaskets: Tubular or fingered design of neoprene or polyvinyl chloride, or block design of sponge neoprene.
 - H. Bituminous Coating: FS TT-C-494 or SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coating.
 - I. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
 - J. Elastomeric Sealant: Generic type recommended by unit manufacturer, compatible with joint surfaces; comply with FS TT-S-00227-E, TT-S-00230C, or TT-S-001543A.
 - K. Roofing Cement: ASTM D 2822, asphaltic.
- 2.03 PREFABRICATED CURBS/EQUIPMENT SUPPORTS
- A. Comply with loading and strength requirements indicated where units support other work.
 - 1. Coordinate dimensions with rough-in sheets or shop drawings of equipment supported.
 - 2. Fabricate of structural quality galvanized sheet steel (ASTM A 570, Grade as required) prepared for painting and factory-primed and painted with 2-mil thickness of baked-on synthetic enamel, after fabrication.
 - B. Curb to be complete with integral cant and base plates (for deck support), and internally reinforced with 1" X 1" X 1/8" steel angle where curbs longer than 3'-0" along any side. Base profile to be coordinated with roof insulation thickness.
 - 1. Provide preservative-treated wood nailers at tops of curbs, coordinate with thickness of insulation and roof flashing indicated, tapered as necessary to compensate for roof deck slopes of 1/4" per ft. and less.
 - C. Except as otherwise indicated or required for strength and/or depth of insulation, fabricate units of min. 14-gage (0.0747") metal, and to min. height of 12".
 - 1. Fabricate with continuously mitered and welded corner joints.
 - D. Curb to be lined with factory installed 1-1/2" thick, 3 pound density rigid fiberglass insulation board, vertically and horizontally, full height and length of curb.
 - E. Sloping Roofs: Where slope of roof deck exceeds 1/4" per ft., fabricate curb/support units with height tapered to match slope, to result in level installation of tops of units.

- F. Manufacturer: Subject to compliance with requirements, provide prefabricated curbs/equipment supports by one of following:
1. Custom Curb, Inc.; Chattanooga, TN
 2. The Pate Company; Broadview, IL
 3. ThyCurb Div./ThyBar Corp.; Addison, IL

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General:
1. Comply with manufacturer's instructions and recommendations.
 2. Coordinate with installation of roof deck and other substrates to receive accessory units, and vapor barriers, roof insulation, roofing and flashing; as required to ensure that each element of work performs properly, and combined elements are waterproof and weathertight.
 3. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures. Unless noted otherwise weld prefabricated curbs to structural steel/bar joists in accordance with manufacturers written instructions and as necessary to adequately support loads imposed upon curb.
 4. Except as otherwise indicated install roof accessory items in accordance with construction details of "NRCA Roofing and Waterproofing Manual".
- B. Isolation: Where metal surfaces of units installed in contact with noncompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.
- C. Flange Seals: Except as otherwise indicated, set flanges of accessory units in thick bed of roofing cement, to form seal.
- D. Cap Flashing:
1. Where cap flashing required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counter flashing).
 2. Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.
- E. Operational Units:
1. Test operate units with operable components.
 2. Clean and lubricate joints and hardware.
 3. Adjust for proper operation.

3.02 CLEANING AND PROTECTION

- A. Clean exposed metal and plastic surfaces in accordance with manufacturer's instructions; touch up damaged metal coatings.

3.03 PAINTING

- A. Refer to Section 09900, Painting and Finishing for painting requirements.
1. All surfaces of hatch and curb, inside and out, shall be painted.

END OF SECTION 07 7200

**SECTION 07 9200
JOINT SEALERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Extent of each form and type of joint sealer indicated on drawings and schedules.
- B. Section includes joint sealers for following locations:
 - 1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces, elastomeric joint sealant, use NT, as indicated below:
 - a. Joints between architectural precast concrete units.
 - b. Control and expansion joints in unit masonry.
 - c. Joints of stonework set without mortar.
 - d. Joints of stonework set with mortar including copings and cornices.
 - e. Joints between different materials listed above.
 - f. Perimeter joints between materials listed above and frames of doors and windows.
 - g. Other joints as indicated.
 - 2. Exterior joints in horizontal traffic surfaces, elastomeric joint sealant, use T as indicated below:
 - a. Control and expansion joints in brick pavers.
 - b. Control, expansion, and isolation joints in cast-in-place concrete slabs for floors and paving.
 - c. Tile control and expansion joints.
 - d. Joints between different materials listed above.
 - e. Other joints as indicated.
 - 3. Interior joints, 3/8" or less in width, in vertical surfaces and horizontal nontraffic surfaces, solvent-release-curing joint sealants as indicated below:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - e. Perimeter joints of toilet fixtures.
 - f. Other joints as indicated.
 - 4. Interior joints, greater than 3/8" in width, in vertical surfaces and horizontal nontraffic surfaces, elastomeric joint sealant, use NT, as indicated below:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - c. Joints on underside of precast beams and planks.
 - d. Other joints as indicated.
 - 5. Other interior joints, miscellaneous sealants, as indicated below:
 - a. Sight exposed locations, to provide finished appearance, where not specified above.
- C. Sealing joints in exterior insulation and finish system specified in Division-7 section: "Exterior Insulation and Finish System".
- D. Sealing joints related to flashing and sheet metal for roofing specified in Division-7 Section: "Flashing and Sheet Metal."
- E. Sealants for glazing purposes specified in Division-8 Section "Glass and Glazing."

- F. Sealing concealed perimeter joints of gypsum drywall partitions to reduce sound transmission characteristics specified in Division-9 Section "Gypsum Drywall."
- G. Sealing tile joints specified in Division-9 Section "Tile."

1.03 SYSTEM PERFORMANCES

- A. Provide joints sealers produced and installed to establish and maintain watertight and airtight continuous seals.

1.04 SUBMITTALS

- A. Product Data from manufacturer's for each joint sealer product required, including instructions for joint preparation and joint sealer application.
- B. Samples for Initial Selection Purposes: Manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- C. Samples for verification purposes of each type and color of joint sealer required.
 - 1. Install joint sealer samples in 1/2 inch wide joints formed between two 6" long strips of material matching appearance of exposed surfaces adjacent to joint sealers.
- D. Certificates from manufacturers of joint sealers attesting that products comply with specification requirements and are suitable for use indicated.
- E. Qualification data complying with requirements specified in "Quality Assurance" article.
 - 1. Include list of completed projects with project name, addresses, names of Architects and Owners, plus other information specified.
- F. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings tested for compatibility and adhesion with joint sealants.
 - 1. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- G. Product test reports for each type of joint sealers indicated, evidencing compliance with requirements specified.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Installer successfully completed within last 3 years at least 3 joint sealer applications similar in type and size to that of this Project.
- B. Testing Laboratory Qualifications: To qualify for acceptance, independent testing laboratory demonstrate to Architect's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has experience and capability to conduct satisfactorily testing indicated without delaying progress of Work.
- C. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from single manufacturer for each different product required.
- D. Preconstruction Compatibility and Adhesion Testing: Submit samples of all materials that contact or affect joint sealers to joint sealer manufacturers for compatibility and adhesion testing, as indicated below:
 - 1. Use test methods standard with manufacturer to determine if priming and other specific joint preparation techniques required to obtain rapid, optimum adhesion of joint sealers to joint substrates.
 - 2. Perform tests under normal environmental conditions that exist during actual installation.
 - 3. Submit min. 9 pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
 - 4. Schedule sufficient time for testing and analysis of results to prevent delay in progress of Work.
 - 5. Investigate materials failing compatibility or adhesion tests and obtain joint sealer manufacturer's written recommendations for corrective measures, including use of specially formulated primers.

6. Testing not required when joint sealer manufacturer able to submit joint preparation data required above acceptable to Architect and based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
 - E. Product Testing: Provide comprehensive test data for each type of joint sealer based on tests conducted by qualified independent testing laboratory on current product formulations within 24-month period preceding date of Contractor's submittal of test results to Architect.
 1. Test elastomeric sealants for compliance with requirements specified by reference to ASTM C 920.
 2. Include test results for hardness, stain resistance, adhesion and cohesion under cyclic movement (per ASTM C 719), low-temperature flexibility, modulus of elasticity at 100% strain, effects of heat aging, and effects of accelerated weathering.
 3. Include test results performed on jointsealers after curing 1 year.
 - F. Field-Constructed Mock-Ups: Prior to installation of joint sealers, apply elastomeric sealants to following selected building joints indicated below for further verification of colors selected from sample submittals and to represent completed work for qualities of appearance, materials and application:
 1. Joints in field-constructed mock-ups of assemblies specified in other sections indicated to receive elastomeric joint sealants in this Section.
 2. Retain mock-ups during construction as standard for judging completed construction.
- 1.06 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials to Project 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 materials in compliance with manufacturer's recommendations to prevent deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.
- 1.07 PROJECT CONDITIONS
- A. Environmental Conditions: Do not proceed with installation of joint sealers under following conditions:
 1. When ambient and substrate temperature conditions outside limits permitted by joint sealer manufacturers or as listed below; which ever is the most stringent.
 2. When ambient and substrate temperature conditions outside limits permitted by joint sealer manufacturer or below 40°F (4.4°C).
 3. When joint substrates wet due to rain, frost, condensation or other causes.
 - B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths less than allowed by joint sealer manufacturer for application indicated.
 - C. Joint Substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with adhesion removed from joint substrates.
- 1.08 SEQUENCING AND SCHEDULING
- A. Sequence installation of joint sealers to occur min. 21 nor max. 30 days after completion of waterproofing, unless otherwise indicated.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealers, joint fillers and other related materials compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

- B. Colors: Provide color of exposed joint sealer indicated or, if not otherwise indicated, selected by Architect from manufacturer's standard colors.
- C. Except as noted formulate sealant for interior joints to accept and hold paint after curing.

2.02 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class and Uses.
- B. One-Part Nonsag Urethane Sealant for Use NT: Type S; Grade NS; Class 25; and Uses NT, M, A, and, as applicable to joint substrates indicated, O.
- C. One-Part Nonsag Urethane Sealant for Use T: Type S; Grade NS; Class 25, and complying with following requirements for Uses:
 - 1. Uses T, NT, A, and, as applicable to joint substrates indicated, O.
- D. Products: Subject to compliance with requirements, provide one of following:
 - 1. One-Part Nonsag Urethane Sealant for Use NT:
 - a. "Chem-Calk 900"; Bostik Construction Products Div.
 - b. "Chem-Calk 2639"; Bostik Construction Products Div.
 - c. "Vulkem 116"; Mameco International, Inc.
 - d. "Vulkem 921"; Mameco International, Inc.
 - e. "Dynatrol I"; Pecora Corp.
 - f. "Permapol RC-1"; Products Research & Chemical Corp.
 - g. "Sikaflex-1a"; Sika Corp.
 - h. "Sikaflex-15LM"; Sika Corp.
 - i. "Sonolastic NP 1"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
 - j. "Dymonic"; Tremco, Inc.
 - 2. One-Part Nonsag Urethane Sealant for Use T:
 - a. "Chem-Calk 900"; Bostik Construction Products Div.
 - b. "Permapol RC-1"; Products Research & Chemical Corp.
 - c. "Sikaflex-1a"; Sika Corp.
 - d. "Sikaflex-15LM"; Sika Corp.

2.03 SOLVENT-RELEASE-CURING JOINT SEALANTS

- A. Butyl Sealant: Manufacturer's standard one part, nonsag, solvent-release-curing, polymerized butyl sealant complying with FS TT-S-001657 for Type I and formulated with min. of 75% solids nonstaining, paintable, and have tackfree time of 24 hours or less.
- B. Pigmented Small Joint Sealant: Manufacturer's standard, solvent-release-curing, pigmented, synthetic rubber sealant formulated for sealing joints 3/16" or smaller in width.
- C. Products: Subject to compliance with requirements, provide one of following:
 - 1. Butyl Sealant:
 - a. "Chem-Calk 300"; Bostik Construction Products Div.
 - b. "BC-158"; Pecora Corp.
 - c. "PTI 757"; Protective Treatments Inc.
 - d. "Tremco Butyl Sealant"; Tremco Inc.
 - 2. Pigmented Small Joint Sealant:
 - a. "PTI 200"; Protective Treatments, Inc.
 - b. "Tremco Seam Sealer"; Tremco Inc.
 - c. "Chem-Calk 300"; Bostik Construction Products Div.

2.04 MISCELLANEOUS JOINT SEALANTS

- A. Butyl-Polyisobutylene Sealant: Manufacturer's standard, solvent-release-curing, butyl-polyisobutylene sealant complying with AAMA 809.2, recommended for concealed joints.
- B. Butyl-Polyisobutylene Tape Sealant: Manufacturer's standard, solvent-free, butyl-polyisobutylene tape sealant with solids content of 100% complying with AAMA 804.1; formulated nonstaining, paintable, and nonmigrating in contact with nonporous surfaces; packaged on rolls with release paper on one side; with or without reinforcement thread to prevent stretch.
- C. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Butyl-Polyisobutylene Sealant:
 - a. "BR-96 Curtain Wall Sealant"; Pecora Corp.
 - b. "PTI 404"; Protective Treatments, Inc.
 - c. "Butyl Sealant"; Tremco Inc.
 - 2. Butyl-Polyisobutylene Tape Sealant:
 - a. "Extru-Seal Tape"; Pecora Corp.
 - b. "Shim-Seal Tape"; Pecora Corp.
 - c. "PTI 606;" Protective Treatments, Inc.
 - d. "Tremco 440 Tape"; Tremco Inc.

2.05 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type which are nonstaining; compatible with joint substrates, sealants, primers and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Elastomeric Foam Joint Fillers:
 - 1. Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, non-absorbent to water and gas, capable of remaining resilient at temperatures down to -26 degrees F.
 - 2. Provide products with low compression set and of size and shape to provide secondary seal, to control sealant depth and otherwise contribute to optimum sealant performance.
- C. Bond-Breaker Tape:
 - 1. Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure.
 - 2. Provide self-adhesive tape where applicable.

2.06 MISCELLANEOUS MATERIALS

- A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Provide nonstaining, chemical cleaners of type acceptable to manufacturer of sealants and sealant backing materials, not harmful to substrates and adjacent nonporous materials, and not leave oily residues or otherwise have detrimental effect on sealant adhesion or in-service performance.
- C. Masking Tape: Provide nonstaining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.

2.07 JOINT FILLERS FOR CONCRETE PAVING

- A. General: Provide joint fillers of thickness and widths indicated or required.
- B. Bituminous Fiber Joint Filler: Preformed strips of composition below, complying with ASTM D 1751:
 - 1. Asphalt saturated fiberboard, 1/2" thick unless otherwise indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance.
 - 1. Do not proceed with installation of joint sealers until unsatisfactory conditions corrected.

3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and following requirements:
 - 1. Remove all foreign material from joint substrates interfering with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellents; water; surface dirt and frost.
 - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or combination of these methods to produce clean, sound substrate capable of developing optimum bond with joint sealers.
 - 3. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 - 4. Remove laitance and form release agents from concrete.
 - 5. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile and other non-porous surfaces by chemical cleaners or other means not harmful to substrates or leaving residues capable of interfering with adhesion of joint sealers.
- B. Joint Priming:
 - 1. Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer substrate tests or prior experience.
 - 2. Apply primer to comply with joint sealer manufacturer's recommendations.
 - 3. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
 - 4. Masking Tape:
 - a. Use masking tape where required to prevent contact of sealant with adjoining surfaces otherwise permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears.
 - b. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALERS

- A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications and conditions indicated.
- C. Solvent-Release-Curing Sealant Installation Standard: Comply with requirements of ASTM C 804 for use of solvent-release-curing sealants.
- D. Installation of Sealant Backings: Install sealant backings to comply with following requirements:
 - 1. Install joint-fillers of type indicated to provide support of sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
 - 2. Do not leave gaps between ends of joint-fillers.
 - 3. Do not stretch, twist, puncture or tear joint fillers.
 - 4. Remove absorbent joint fillers if wet prior to sealant application and replace with dry material.
 - 5. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where adhesion of sealant to surfaces at back of joints result in sealant failure.

- E. Installation of Sealants: 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 widths which allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants:
 - 1. 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.
 - 2. Remove excess sealants from surfaces adjacent to joint.
 - 3. Do not use tooling agents which discolor sealants or adjacent surfaces or not approved by sealant manufacturer.
 - 4. Provide concave joint configuration per Figure 6A in ASTM C 962, unless otherwise indicated.
 - 5. Provide flush joint configuration per Figure 6B in ASTM C 962, where indicated.
 - 6. Use masking tape to protect adjacent surfaces of recessed tooled joints.
 - 7. Provide recessed joint configuration per Figure 6C in ASTM C 962, of recess depth and at locations indicated.

3.04 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.05 PROTECTION

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so they are without deterioration or damage at time of Final Acceptance.
 - 1. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

END OF SECTION 07 9200

SECTION 23 0500
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. HVAC demolition.
 - 3. Equipment installation requirements common to equipment sections.
 - 4. Painting and finishing.
 - 5. Concrete bases.
 - 6. Supports and anchorages.

1.03 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspace, 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 chases.
- 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.
- F. The following are industry abbreviations for plastic materials:
 - 1. PVC: Polyvinyl chloride plastic.

1.04 QUALITY ASSURANCE

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- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.05 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 to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.06 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces.
- D. Coordinate locations of floor drains and floor cleanouts with HVAC Equipment pads and units in all mechanical equipment rooms, closets and platform areas. Coordination layout drawings shall be prepared and coordinated by all trades.
- E. No mechanical, plumbing or fire protection equipment, ductwork or piping shall be located overhead within 42" of electrical switchboards or panelboards.
- F. No water piping (HVAC, domestic, storm, sanitary, or sprinkler) shall be located above electrical switchboards or panelboards. If the governing authority requires fire sprinklers in the electrical rooms, spray shields shall be fabricated and installed to protect the live panels or switchboards from spray from sprinkler discharge.
- G. Coordinate sanitary waste and vent stub ups and rainwater/downspout stub ups at slab on grade installations with structural plans to ensure that footings and/or grade beams are dropped or stepped to avoid piping penetrations thru footings and grade beams.

1.07 CODES AND REGULATIONS

- A. All materials and workmanship shall comply with the latest editions of the following codes and standards, as applicable:

Manufacturer's Standardization Society (MSS) Standard Practice (SP) 58: Pipe Hangers and Supports - Materials, Design and Manufacture

MSS SP-69: Pipe Hangers and Supports - Selection and Application

MSS SP-69: Pipe Hangers and Supports - Fabrication and Installation Practices

National Fire Protection Association (NFPA) Pamphlet 13: Installation of Automatic Sprinkler Systems

NFPA 13: Installation of Sprinkler Systems

NFPA 24: Installation of Private Fire Service Mains and Their Appurtenances

NFPA 30: Flammable and Combustible Liquids Code

NFPA 90A: Installation of Air Conditioning and Ventilating Systems

NFPA 90B: Installation of Warm Air Heating and Air Conditioning Systems

NFPA 96: Installation of Equipment for the Removal of Smoke and Grease Laden Vapors from Commercial Cooking Equipment

NFPA 101: Safety to Life from Fire in Buildings and Structures

NFPA 211: Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances

NFPA 231: General Storage

National Electrical Code, 2011 Edition, with Georgia Amendments

International Mechanical Code, 2012 Edition, with Georgia Amendments

International Energy Conservation Code, 2009 Edition, with Georgia Amendments

International Building Code, 2012 Edition, with Georgia Amendments

International Plumbing Code, 2012 Edition, with Georgia Amendments

International Fuel Gas Code, 2012 Edition, with Georgia Amendments

International Fire Code, 2012 Edition, with Georgia Amendments

All local prevailing County codes and Ordinances

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- B. All workmanship and materials shall comply with all ordinances and regulations of all local authorities having jurisdiction.
- C. Contractor shall obtain all permits and licenses, and pay all fees, as required for execution of the contract. Arrange for necessary inspections required by City, County, State and other authorities having jurisdiction, and deliver certificates of approval to the Owner. In compliance with the Georgia State Boiler Code, it is the responsibility of the Contractor (at his expense) to have each boiler and/or applicable pressure vessel inspected by a State of Georgia certified inspector upon installation of this equipment.
- D. This inspection report shall be submitted to the Georgia Department of Labor, Safety Engineering Section, 501 Pullman Street, Room 210, Atlanta, Georgia 30312, Attention Chief Safety Engineer.
- E. Upon the Georgia Department of Labor review of the inspection report and their inspection, they will place a tag indicating the State Serial Number on the inspected piece of equipment and issue a certificate of boiler or pressure vessel inspection. The original certificate issued is to be posted in the main Mechanical Room, with a copy sent to Forsyth County Schools and one copy is to be included in the closeout documents.

1.08 RECORD DRAWINGS

- A. As the work progresses, the Contractor shall maintain records and record all changes made daily on a set of contract mechanical drawings (HVAC, Plumbing & Fire Protection) during the progress of the work. The in-progress set of marked-up drawings, clearly showing the nature and extent of all changes, shall be maintained in the construction office at the site and clearly marked "Record Drawings". The "Record Drawings" shall be up to date and available for use at the time of any job site visit by the Engineer or Architect. The completed "Record Drawings" shall be presented to the Architect upon completion and acceptance of the work. Final payment and "close-out" of the project shall be dependent upon receipt and acknowledgment of the completed "Record Drawings".
- B. The Engineer shall furnish to the Contractor electronic files of the Contract Drawings in AutoCAD format for the Contractors' use in preparing a final electronic copy of the record drawings which shall incorporate all of changes made including all project addenda. Drawing changes shall be identified as follows:
 - 1. The affected change shall be identified in an enclosed clouded area of a consistent color not used to indicate the noted change.
 - 2. Each cloud shall have an identifier adjacent to the cloud identifying the date and origin of the change. (i.e., 1-12-06, Construction Directive, 1-12-06, Change Proposal, 1-12-06, Field Coordination, etc.).
- C. Submission of electronic Record Drawings shall be made on compact disk in AutoCAD format and accompany one (1) full size set of bond plots in color on white background. Plots shall be generated from the CD of electronic files. Electronic file names and plot sheet numbering shall match Contract Document format.

1.09 ACCESS DOORS & PANELS

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- A. Furnish an access door and panels for each pipe and duct chase for each floor, fire dampers, etc. Size as required for access, 16" X 16" minimum.
- B. Also, provide access doors in all non-removable ceilings and in partitions and walls where necessary to maintain access to fire dampers, manual dampers, valves, shock arrestors, and other mechanical devices requiring access.
- C. Any access door installed in fire rated surface or assembly shall carry a U.L. Listing and an approved fire rating for that construction type.
- D. Provide access doors/panels as required to test and reset automatic fire dampers.
- E. Provide all access doors to the General Contractor for the timely inclusion in the building construction.
- F. Refer to architectural section "08311 – ACCESS DOORS AND FRAMES" for product's construction and installation requirements.
- G.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

PART 3 - EXECUTION

3.01 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.02 PAINTING

- A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Painting."

- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.03 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.04 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
- C. Field Welding: Comply with AWS D1.1.
- D. Provide factory start up on all major pieces of equipment, with letter of certification stating proper installation is present for the following components:

- Roof mounted A/C units
- Condensing units
- Air-handling Units
- Fan-Coil Units
- Controls System
- Energy Management System
- Energy Recovery Units

3.05 SHOP DRAWINGS

- A. Submit a minimum of three hard copy sets of shop drawings along with an electronic formatted submittal for approval prior to commencing work. Hard copy shop drawings shall be bound in a three ring binder and shall include an index page with each item listed and referenced to sections with tabs. Tabs shall be cross referenced to index page. All shop drawings shall be prepared and submitted as a single package. **NO SHOP DRAWINGS WILL BE CHECKED UNTIL ALL HAVE BEEN SUBMITTED.** (HVAC

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controls submittals and any items with exceptionally long lead times that may affect the project completion date, as determined by the Engineer may be submitted separately). **Electronic shop drawings shall be a single PDF file and formatted as required for hard copy submittals. Each section shall be a bookmarked (tabbed) link named to describe the section. (ELECTRONIC SHOP DRAWINGS NOT PROPERLY FORMATTED WILL BE RETURNED UNCHECKED.)**

- B. The following format shall be followed:
1. The submittal cover sheet shall include-
Project Name
Type of Shop Drawing including trade (HVAC, Plumbing, Fire Protection)
Mechanical Contractor's Company Name
Date of Submittal
 2. The first sheet inside the submittal shall include all items on the cover sheet plus the following-
Owner
Architect
Engineer
Mechanical Contractor's Project Manager's Name
 3. The supervising license holder(s) shall be identified, and a copy of their current valid license shall be included.
 4. The second sheet shall include the following typed statement, signed and dated by the mechanical contractor's project manager-

"The enclosed submittal (shop drawings) has been reviewed for accuracy of equipment and system quality and component quantities. The available voltages have been coordinated with the electrical contractor. All coordination items with other trades have been completed including structural, electrical, and other mechanical division disciplines prior to ordering any equipment."
- C. The Contractor shall review the information prepared by his suppliers and note any changes required prior to submitting the information to the Engineer and shall include the form (found at the end of this section), Exhibit 1, entitled "Certification of Compliance - Shop Drawings" with each submittal prior to the index page and submittal data sheets. Failure to complete and execute this form will result in rejection of the submittal without review.
- D. Each individual submittal item shall be marked to show Specifications Section and Paragraph number which pertains to the item. Shop Drawings shall clearly indicate location, fixture no. or equipment designation, etc., so that the intended use of the equipment can be readily identified. Failure to make submittals accordingly shall be considered cause for rejection of shop drawings.
- E. Submittals shall be supported by descriptive material, such as catalog cuts, diagrams, certified performance curves and charts published by the manufacturer to show conformance to specification and drawing requirements, model numbers alone will not be acceptable. All literature shall clearly indicate the specified model number, options to be included, dimensions, arrangement, rating and characteristics of the proposed equipment. Capacities and ratings shall be based on conditions indicated or specified herein. Any deviations from specified equipment shall be clearly noted in red.
- F. The Engineer will review the shop drawings for errors in the Contractor's interpretation of the design intent only. Corrections or comments made on shop drawings during review shall not relieve the Contractor from compliance with requirements of the contract documents, plans and specifications.

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Review of shop drawings shall not relieve the Contractor from the responsibility for conforming and correlating all quantities and dimensions, coordinating his work with that of other trades, and performing his work in a safe and satisfactory manner.

- G. Review of shop drawings shall not permit any deviations from the plans and specifications nor shall it permit changes to the plans and specifications by the Engineer. Changes to or deviations from the contract documents are subject to the provisions of the General Conditions of the contract. Any required changes will then be issued by the Architect and executed by both the Owner and Contractor.
- H. Each individual submittal item shall be marked to show Specifications Section and paragraph number which pertains to the item. Shop Drawings shall clearly indicate location, fixture no. or equipment designation, etc., so that the intended use of the equipment can be readily identified. Shop drawings shall be submitted for each of the following items:

Fans	Fire & Smoke Dampers
Air Distribution Devices	Automatic Dampers
Roof Mounted Air Intake/Relief Hoods	Flexible Ductwork
Electric Heaters	Ductwork & Ductwork Construction
Duct Access Panels	Vibration Isolation Equipment
Gas Flues	Roof Mounted A/C Units
Air-handling Units	Condensing Units
Manual Dampers	Roof Curbs
Valves & Unions	Access Covers & Panels
Valve Schedules and Diagrams	
Sheet Lead Flashing	
Pressure Reducing Valves	
Pipe Accessories	Bi-Polar Ionization Units
Pipe Hangers, Supports & Accessories	Contractor Start up forms
Fan-coil Units	
Controls & Control Diagrams including Wiring Plans	
Pipe & Duct Insulation & Accessories	

- I. For miscellaneous items not listed here, contractor shall submit shop drawings for approval, unless the item is to be provided and installed **exactly** as specified, without variance.
- J. Contractor shall provide a sign-in sheet for each piece of equipment requiring Owner training noted in division 15. Training required for all equipment including the following: Electric heaters, rooftop units, split systems, and HVAC controls (controls shall include ALC Controls as well as any non- ALC Controls, i.e. wall mounted timers and wall mounted switches).
- K. Submit evidence of welders' qualifications prior to performing any welds.
- L. **In addition, contractor shall prepare and submit dimensioned shop drawings (drawn at minimum 1/4"=1'-0" scale) of all ductwork, piping and equipment (HVAC) on the entire project. The drawings shall be created with computer aided drafting software. This shall also include actual mechanical room layouts, typical sections through corridors, pipe sleeves and other penetrations through slabs and walls for HVAC including fire and smoke walls. These shop drawings shall be submitted as PDF, along with a set of prints equal to the number of copies of submittals required by the Contract Documents.**

SECTION 23 0500 - Exhibit No. 1

CERTIFICATION OF COMPLIANCE - SHOP DRAWINGS

To:

Project:

I have reviewed the contract documents, including but not limited to specifications, drawings, addenda, and change orders. To the best of my knowledge the materials described by the enclosed shop drawings are consistent with and meet the requirements of the aforementioned documents. I further recognize that; 1) the engineers review is to assist me in complying with the documents by checking for errors in my interpretation of the requirements set forth in the contract documents, 2) review of shop drawings, by the engineer, shall not relieve me of my responsibility for confirming and correlating all quantities, dimensions and work with that of other trades, and for performing the work in a safe and satisfactory manner, and 3) review of shop drawings, by the engineer, shall not permit any deviations from plans and specifications.

I understand that I will be required to remove and replace at no additional cost to the owner any item found to be inconsistent with or not meet the requirements of the contract documents.

The undersigned states that the above is true to the best of his knowledge and that he has the authority to legally bind his firm to the above terms. Failure to provide a legally binding signature shall void submittal.

Sub Contractor:

By: _____ Date: _____

Ga. State License No (Required): _____

Title: _____

Company: _____

General Contractor:

By: _____ Date: _____

Title: _____

Company: _____

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SECTION 2 0500 - Exhibit No. 2

A/C Contractor shall make out start-up cards for all heat and cool units as per start up card furnished below and shall furnish same before substantial completion inspection for each phase of construction.

A/C CONTRACTOR'S START-UP CARD
Walker County Schools

School Name _____

HVAC Contractor _____

Unit # _____

Unit Model Number _____ Unit Serial Number _____

A/C EQUIPMENT

Rated Volts - _____

Rated Amps - _____

COOLING

HEATING

Discharge Pressure _____

Suction Pressure _____

Return Air Temp. _____

Supply Air Temp. _____

GAS FIRED EQUIPMENT

(Packaged Units, etc.)

Unit # _____

Actual Manifold Pressure: Mfg. Rated Manifold Pressure:

Actual Stack Pressure:

Rated Stack Pressure:

ELECTRIC HEAT

Unit # _____

Actual Volts

Rated Volts

Rated Amps

Actual Amps

END OF SECTION 23 0500

**SECTION 23 0513
COMMON MOTOR REQUIREMENTS FOR HVAC**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.03 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.01 GENERAL MOTOR REQUIREMENTS

- A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.
- C. Acceptable Manufacturers: Baldor, Marathon, US.

2.02 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.03 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.

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- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
 - C. Service Factor: 1.15.
 - D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
 - E. Multispeed Motors: Separate winding for each speed.
 - F. Rotor: Random-wound, squirrel cage.
 - G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
 - H. Temperature Rise: Match insulation rating.
 - I. Insulation: Class F.
 - J. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
 - K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.
- 2.04 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS
- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- 2.05 SINGLE-PHASE MOTORS
- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
 - B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
 - C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
 - D. Motors 1/20 HP and Smaller: Shaded-pole type.
 - E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

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2.06 STARTERS

- A. Power controllers shall be provided for the equipment furnished under this specification. When not provided as a component of the equipment specified, external starters shall be provided under this division to control the equipment as outlined in the control specifications. Starters and contactors shall be constructed in accordance with the NEMA Standards. Starters shall have overload and running protection in each power phase.
- B. Voltage for holding coils shall not exceed 120 volts, unless otherwise specified; provide built-in transformers with fuses. Provide auxiliary contacts as required by control circuits.
- C. Starters shall be furnished with individual phase thermal overload protection, and with two (2) normally open auxiliary contacts, "Hand-Off-Auto" switch, 24 VAC coil, 24 VAC control transformer, and pilot light.
- D. All external starters shall have NEMA-4 rated enclosures for weatherproof operation and stainless steel enclosure finish.
- E. Motor starters shall be manufactured by Furnas, Square D, Westinghouse, Siemens, and General Electric.
- F. Each starter shall be provided engraved laminated plastic nameplates describing the piece of equipment being served.

2.07 VARIABLE SPEED DRIVE

- A. Variable speed frequency drives shall be provided for the new main water source heat pump loop circulating pump motor (pumps P-HP1 & P-HP2). Variable speed frequency drives shall also be provided for the cooling tower fan motors. All drives shall be located in the main mechanical room.
- B. Drives shall be specifically manufactured for HVAC application. The drives shall digitally control both voltage and frequency to standard induction motors.
- C. Standard features include PID control, DC link reactor for harmonics control, and energy optimizing capabilities.
- D. The entire package shall be factory engineered for low noise and high energy efficiency, and shall be factory assembled and tested, and carry the U.L. label.
- E. Units shall be rated for and comply with the following minimum criteria:
 - 1. Displacement factor: 0.98 or greater
 - 2. Drive efficiency: 97% or greater
 - 3. Inline voltage range for full load: Nominal 10% + or -
 - 4. Adjustable maximum speed: to 120 Hz
 - 5. Adjustable minimum speed : to 0 Hz
 - 6. Adjustable acceleration time: to 3,600 seconds
 - 7. Adjustable deceleration time: to 3,600 seconds

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8. Maximum number of preset speeds:16
 9. Maximum number of frequency stepovers:4
 10. Maximum number of accel rates:4
 11. Maximum number of decel rates:4
 12. Number of programmable digital inputs:8
 13. Number of programmable analog inputs: 3, 2 for voltage, 1 for current
 14. Number of programmable analog outputs: 2
 15. Number of relay outputs: (1) 50 VAC, 1 A standard, (1) Form C 240 VAC, 2 A standard, (4) additional
 16. Relay ON delay and Relay OFF delay:0 to 600 seconds
 17. Display Languages: 9
- F. Standard features:
1. DC link reactor on both DC bus lines for control of harmonic distortion and line-coupled electrical noise
 2. Built-in two setpoint PID controller
 3. Built-in N2 communication
 4. Built-in FLN communication
 5. All parameters can be uploaded to keypad and downloaded to all drives
 6. "Flying Start" synchronizes drive with a motor rotating in either direction
 7. Auto ramping ensures no-trip acceleration and deceleration
 8. Signal loss detection
 9. Loss of load/broken belt detection
 10. Safety interlock provides external fault indication
 11. Sleep mode stops drive at predetermined operating condition and restarts drive at specified demand to maximize savings and reduce wear of the driven equipment
 12. Constant torque start always available to provide easy starting of high inertia and high friction loads.
- G. Variable speed drives shall contain automatic by-passes to allow operation of equipment on drive failure. Bypass shall include an adjustable time delay to automatically bypass after cycle has expired and drive has not started. Additional contacts to interlock with building management and control system shall be included, and shall indicate drive and line operation.
- H. Unit shall be manufactured by ABB, Graham, Eaton, Reliance.
- I. Provide remote pressure sensor for each drive for input to controller.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive field-installed motors for compliance with requirements, installation tolerances, and other conditions affecting performance.
- B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before motor installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.02 FIELD-INSTALLED MOTOR INSTALLATION

- A. Anchor each motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and align with load transfer link.
- B. Install motors on concrete bases complying with Division 3.
- C. Install wiring between starter and motor in accordance with NEC requirements, and in accordance with the requirements of Division 26.

3.03 VARIABLE SPEED DRIVE INSTALLATION

- A. Installation of drives shall be certified in writing by a representative of the manufacturer.
- B. Manufacturer's representative shall verify proper programming, installation and interface with related equipment, and confirm proper operation of device.
- C. Drives shall maintain all manufacturers and code required clearances.
- D. Install wiring between drive and motor in accordance with NEC requirements, and in accordance with the requirements of Division 26.

3.04 STARTER\VFD INSTALLATION

- A. Installation of starters and drives shall be in accordance with the requirements of the latest NEC, and conform to the conditions indicated on the electrical documents.
- B. Installation shall be coordinated with work of other divisions to provide adequate clearances for service and operation.

END OF SECTION 23 0513

SECTION 23 0529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following hangers and supports for HVAC system piping and equipment:
 - 1. Steel pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Thermal-hanger shield inserts.
 - 5. Fastener systems.
 - 6. Equipment supports.
- B. Related Sections include the following:
 - 1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
 - 2. Division 23 Section " Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.
 - 3. Division 23 Section(s) " Metal Ducts" and "Nonmetal Ducts" for duct hangers and supports.

1.03 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.04 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.05 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.
 - 2. Thermal-hanger shield inserts.

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3. Powder-actuated fastener systems.

1.06 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.
- B. Welding: Qualify procedures and personnel according to the following:
 1. AWS D1.1, "Structural Welding Code--Steel."
 2. AWS D1.2, "Structural Welding Code--Aluminum."
 3. AWS D1.3, "Structural Welding Code--Sheet Steel."
 4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
 5. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
 1. B-Line Systems, Inc.; a division of Cooper Industries.
 2. Carpenter & Paterson, Inc.
 3. ERICO/Michigan Hanger Co.
 4. Grinnell Corp.
 5. National Pipe Hanger Corporation.
 6. PHD Manufacturing, Inc.
- C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.03 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.04 METAL FRAMING SYSTEMS

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- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers:
 - 1. B-Line Systems, Inc.; a division of Cooper Industries.
 - 2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
 - 3. Power-Strut Div.; Tyco International, Ltd.
 - 4. Thomas & Betts Corporation.
 - 5. Unistrut Corp.; Tyco International, Ltd.
- C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.05 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Manufacturers:
 - 1. Carpenter & Paterson, Inc.
 - 2. ERICO/Michigan Hanger Co.
 - 3. Pipe Shields, Inc.
 - 4. Rilco Manufacturing Company, Inc.
 - 5. Value Engineered Products, Inc.
- C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.06 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 - 1. Manufacturers:
 - a. Hilti, Inc.
 - b. ITW Ramset/Red Head.
 - c. Powers Fasteners.
- B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

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1. Manufacturers:
 - a. B-Line Systems, Inc.; a division of Cooper Industries.
 - b. Hilti, Inc.
 - c. ITW Ramset/Red Head.
 - d. Powers Fasteners.

2.07 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.08 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.01 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 2. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
 3. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 4. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 5. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.

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- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 5. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 6. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- L. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- M. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.02 HANGER AND SUPPORT INSTALLATION

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

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- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick 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.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment. Maximum pipe hanger spacing shall be 8'-0".
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- M. Insulated Piping: Comply with the following:
 - 1. Attach clamps and spacers to piping.
 - a. Clamp may not project through insulation.
 - b. Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and

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ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 40, protective shields on piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
4. Pipes NPS 8 and Larger: Include wood inserts.
5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.03 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.04 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers 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 shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.05 ADJUSTING

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

3.06 PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately

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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.
- B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 23 0529

SECTION 23 0548
VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Isolation pads.
 - 2. Elastomeric hangers.
 - 3. Spring hangers.
 - 4. Seismic snubbers.

1.03 DEFINITIONS

- A. IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.
- C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.04 SUBMITTALS

- A. Product Data: For the following:
 - 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 - 2. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

1.05 QUALITY ASSURANCE

- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.01 VIBRATION ISOLATORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Ace Mountings Co., Inc.
 - 2. Amber/Booth Company, Inc.

3. California Dynamics Corporation.
 4. Isolation Technology, Inc.
 5. Kinetics Noise Control.
 6. Mason Industries.
 7. Vibration Eliminator Co., Inc.
 8. Vibration Isolation.
 9. Vibration Mountings & Controls, Inc.
 10. Vibro-Acoustics
- B. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
1. Resilient Material: Oil- and water-resistant neoprene or rubber.
- C. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.
- D. Spring Hangers Insert drawing designation: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.
1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
 7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

2.02 FACTORY FINISHES

- A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
1. Powder coating on springs and housings.
 2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
 3. Baked enamel or powder coat for metal components on isolators for interior use.
 4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

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- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES.
- B. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.03 VIBRATION-CONTROL DEVICE INSTALLATION

- A. Comply with requirements in Division 07 Section "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.
- B. Equipment Restraints:
 - 1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 2. Provide 1" thick isolation pads beneath each heat pump unit, energy recovery unit and other platform mounted equipment.
- C. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127.
 - 2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 - 3. Brace a change of direction longer than 12 feet.
- D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

3.04 ADJUSTING

- A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 23 0548

SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Piping Labels
 - 3. Valve Tags

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.04 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 EQUIPMENT LABELS

- A. Labels for Equipment:
 - 1. Material: Adhesive film suitable for outdoor use.
 - 2. Letter Color: White.
 - 3. Background Color: Black.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg. F.
 - 5. Minimum Label Size: Labels shall be a minimum of 2-1/4" inches tall.
 - 6. Minimum Letter Size: Letters and numbers shall be a minimum of 2 inches tall.
 - 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation.

2.2 PIPING IDENTIFICATION DEVICES

- A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

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1. Colors: Comply with ASME A13.1, unless otherwise indicated.
 2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
 3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
 4. Pipe with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
 5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- B. Self-Adhesive Pipe Markers not acceptable.
- C. Plastic Tape not acceptable.
- D. Acceptable Manufacturers:
1. T&B/ Westline
 2. Seton
 3. MSI (Marking Services, Inc.)
 4. Brimar Identification & Safety Products
 5. Mifab

2.3 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme. Provide 5/32-inch hole for fastener.
1. Material: 19-gauge minimum brass, 1-1/2" minimum size.
 2. Valve-Tag Fasteners: Self locking cable ties.
- B. Acceptable Manufacturers:
1. T&B/ Westline
 2. Seton
 3. MSI (Marking Services, Inc.)
 4. Brimar Identification & Safety Products
 5. Mifab

PART 3 - EXECUTION

3.01 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.02 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

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- C. Labeled items shall include as a minimum the following:
1. Unitary HVAC Equipment
 2. Starters
 3. Fans
 4. Heaters
 5. Air Handlers
 6. Split Systems

3.3 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
1. Pipes with OD, Including Insulation, Less Than 4 Inches: Snap-on/self-coiling pipe markers. Use color-coded markers lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.
 2. Pipes with OD, Including Insulation, 4 Inches and Larger: Snap-on/self coiling pipe markers. Use color-coded markers with permanent nylon fastener straps, one on each end.
- B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed locations as follows:
1. Near each valve and control device.
 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations through walls, floors, ceilings, and non-accessible enclosures.
 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. Spaced at maximum intervals of 20 feet along each run or otherwise at each wall.
 7. Pipe markings on piping more than 7'-0" above floor shall be rotated to allow full observation from floor.

- C. Band and letter sizes shall conform to the following table:

<u>O.D. of Piping of Covering:</u>	<u>Width of Color Band</u>	<u>Size of Letter/Numbers</u>
1" and smaller	6"	1/2"
1-1/4" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"
8" and larger	18"	2"

- D. Band legend and color and letter color shall conform to the following table:

<u>Piping</u>	<u>Band Legend</u>	<u>Letters</u>	<u>Band Color</u>
Non Potable Water	NPW	Black	Green
Domestic Makeup Water	CW	Black	Green
Natural Gas	G	Black	Yellow
Condensate Drain	CD	Black	Green

3.4 VALVE-TAG INSTALLATION

- A. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:
1. Valve-Tag Size and Shape:

<u>SYSTEM</u>	<u>IDENTIFICATION SHAPE</u>	<u>NUMBERS</u>
Heat Pump Loop	Circle	HP-1,2,3.....
Tower Water	Circle	TW-1,2,3.....
Boiler Hot Water	Circle	HWH-1,2,3.....

2. Each valve tag shall be attached to the handwheel with self-locking cable ties.
3. A valve chart, framed under glass and wall mounted, shall be located in the main mechanical room and shall list each valve by identification number, its location in the piping system - (i.e., hot water, fire main, water heater, etc.) and its function -(i.e., shut-off, balancing, drain, etc.).
4. Gas valves at the meter, generator and on the roof shall not have valve tags.
5. All ceiling tiles which provide access to valves shall be identified with a color-coded valve identification number affixed to the permanent ceiling grid immediately below the valve.

END OF SECTION 23 0553

SECTION 23 0593
TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary conditions and Division 01 Specification Sections, apply to this Section.
- B. All work in this Section must comply with Section 23 0500 of these Specifications.

1.02 QUALIFICATIONS

- A. An independent test and balance agency certified by the Associated Air Balance Council (AABC) that specializes in and whose business is limited solely to testing, adjusting and balancing air conditioning systems shall be retained and shall completely test and balance the HVAC system in complete accordance with Associated Air Balance Council Standards, latest edition, for total system balance. All work shall be performed under direct supervision of an AABC certified test and balance engineer.

1.03 QUALIFICATION SUBMITTALS

- A. Testing and Balancing (TAB) Agency shall submit a company resume listing personnel and project experience in the field of air and hydronic system balancing. Submittal shall include an inventory of all instruments and devices used to test, adjust and balance systems and a working agenda which shall include procedures for testing and balancing each type of air and water system specified indicating all data to be recorded.

1.04 CONTRACT DOCUMENTS

- A. Within 60 days of acceptance of contract, the TAB Agency shall obtain a complete set of Construction Documents, Equipment Specifications, and Equipment Submittals including all pertinent addenda items.
- B. Test and Balance Agency will be retained under separate contract by the Owner.**

- C. The General Contractor or Mechanical Contractor the following items when issued or received:

1. Copies of all Addenda
2. Change Orders
3. Equipment Manufacturer's Submittal Data
4. Mechanical Shop Drawings
5. Temperature Control Shop Drawings
6. Project Schedule

- D. The Mechanical Contractor shall test for fan proper rotation on air moving equipment and all dampers are open and operable. The Mechanical Contractor shall also provide assistance starting, and adjusting system including the replacement of fan sheave as required to achieve required air flow.**

1.05 NOTIFICATION AND SCHEDULING

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- A. Before testing and balancing commences, the TAB Agency shall receive notification in writing from the Mechanical Contractor stating that the HVAC system(s) is operational, complete and ready for balancing. A complete system means more than just physical installation. The Mechanical Contractor shall certify that all prime movers: fans, pumps, refrigerant machines, boilers, etc., are installed in good working order, and that full load performance has been preliminarily tested. Mechanical Contractor shall certify in writing that all equipment has been checked, started, adjusted and operated per the manufacturer's recommendations. Mechanical Contractor shall include copies of factory start-up reports for specified equipment.
- B. The schedule for testing and balancing of the HVAC systems shall be established once notification has been received by the TAB Agency.

1.06 COORDINATION WITH OTHER TRADES

- A. The owner or owner's representative, Mechanical Contractor, Temperature Control Subcontractor and the supplier of the HVAC equipment shall cooperate with the TAB Agency to provide all necessary data on design and proper application of the system components. In addition, they shall furnish all labor and materials required to eliminate any system deficiencies.
- B. The TAB Agency shall coordinate the location and type of all taps, valves, sensors, damper, etc., as required for proper system testing and balancing with the Mechanical Contractor prior to beginning work.
- C. The TAB Agency shall visit project before beginning initial testing and balancing to inspect installation of HVAC system, location and testing of all testing taps, etc., and provide a written report of all deficiencies to the Mechanical Contractor, Mechanical Engineer and Architect.
- D. To bring the HVAC system(s) into a state of readiness for testing, adjusting and balancing, the installing Mechanical Contractor shall perform the following:
 - 1. Activate all equipment in the cooling mode.
 - 2. Activate all equipment in the heating mode
 - 3. Run test all sequences of operation for controls and equipment.

1.07 AIR SYSTEMS

- A. Ensure that all splitters, extractors, volume, smoke and fire dampers are properly located and functional. Dampers serving the requirements of smoke, outside air, return air and exhaust air shall provide tight closure and full opening, with smooth, free operation.
- B. Verify that all supply, return, exhaust and transfer grilles, registers, diffusers are installed properly and free of objectionable noise.
- C. Verify that all fans are operating and free of vibration. All fans and drives shall be checked for proper rotation and belt tension.
- D. Install clean filters in all units prior to testing.
- E. Make all necessary changes as required by the TAB Agency, at no additional charge to the owner.
- F. Water Circulating System
 - 1. Check all pumps for proper alignment and rotation.

2. Ensure that all water systems have been properly cleaned, strainers removed, cleaned, are full and free of air, that expansion tanks have been properly charged and that air vents have been installed in all high points in piping systems.
- G. Temperature Control
1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, and fire and smoke dampers.
 2. Verify that all sensors are calibrated and set for design operating conditions.
 3. Make available to the TAB Agency any needed unique instruments for setting of D.D.C. controls.
 4. Provide assistance and instruction to the TAB Agency in the proper use and settings of control components.

PART 2 - PRODUCTS

2.01 TESTING AND BALANCING INSTRUMENTS

- A. Instruments used for testing and balancing must have been calibrated within a period of six (6) months prior to beginning testing and balancing of this project. All final test analysis reports shall include a letter of certification listing instrumentation used and last date of calibration.

PART 3 - EXECUTION

3.01 PRECONSTRUCTION PLAN CHECK AND REVIEW

- A. The TAB Agency shall preform a preconstruction review of the contract documents and equipment submittals for their effect on the testing and balancing process. Review shall include location and type of volume dampers, air valves, balancing valves, flow metering stations, automatic control valves, pressure sensors, sheet metal and piping shop drawings.
- B. Submit any recommendations for enhancements or changes to the system within 30 days of document review.

3.02 ON-GOING JOB SITE INSPECTIONS

- A. During construction, the test and balance agency shall inspect the installation of pipe systems, sheet metal work, temperature controls and other component parts of the HVAC systems. Inspections shall be performed when 60% of the piping and or sheet metal work is installed and again when 90% of the total HVAC system is installed and prior to insulation of piping systems.
- B. The balancing agency shall submit a written report of each inspection to the owner's representative, the Mechanical Engineer and the contractor responsible for correcting any noted deficiencies.
- C. Inspections shall check for all necessary balancing hardware (dampers, flow meters, valves, pressure taps, thermometer wells, etc.) to determine if they are installed properly and readily accessible.
- D. Identify and evaluate any variations from system design.

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- E. Identify and report possible restrictions in systems (closed dampers, long runs of flexible ductwork, poorly designed or connected duct fittings, excessive piping losses, etc.).

3.03 RECORD & REPORT DATA

- A. The Test and Balance report shall be complete with logs, data and records as required herein. Air and water flow quantities shall be balanced within 5% of the values specified in the contract documents. All logs, data and records shall be typed on white bond paper and bound. The report shall be certified accurate and complete by the Testing and Balancing Agency's registered Professional Engineer.

- B. Six copies of the Certified Test and Balance Reports shall be submitted to the Architect for review and acceptance.

- C. The report shall include, but not be limited to, the following data.

- 1. Project Number
- 2. Contract Number
- 3. Project Title
- 4. Project Location
- 5. Project Architect
- 6. Project Mechanical Engineer
- 7. General Contractor
- 8. Mechanical Contractor
- 9. Date tests were performed
- 10. Certification
- 11. General discussion of system(s) and any abnormalities or problems encountered.
- 12. Test and Report Forms AABC Form No.
 - Cover Sheet 89010
 - Instrument List 89020
 - Air Moving Equipment Test Sheet 89030
 - Exhaust Fan Data Sheet 89031
 - Return/Outside Air Data 89033
 - Air Distribution Test Sheet 89040
 - Temperature Readings 89043
 - Electric Heater Report 89050
 - Cooling Coil Data 89101
 - Combustion Test 89600
 - Other Forms as Required -----

- D. The following items shall be tested, balanced, adjusted as required for proper system operation:

- 1. Adjust all diffusers, grilles and registers to minimize drafts in all areas
- 2. Packaged Units
- 3. Supply and Return Air Grilles and Diffusers
- 4. Supply & Exhaust Fans
- 5. Unit Heaters
- 6. Electric Heaters
- 7. Split Systems

- E. Overall system(s) and installation for compliance with contract drawings and specifications.

3.04 CONTROL SYSTEM VERIFICATION

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- A. Verify that all control devices are properly connected
- B. Verify that all dampers, valves and other controlled devices are operated by the intended controller.
- C. Verify that all dampers and valves are in the position indicating by the controller (open, closed and modulating).
- D. Verify the integrity of valves and dampers in terms of tightness of close-off and full-open positions.
- E. Check that all valves are properly installed in the piping system in relation to direction of flow and location.
- F. Check the calibration of all controllers
- G. Check the locations of all sensors to determine whether their position will allow them sense only the intended temperatures or pressures. Control contractor shall relocate as deemed necessary by the TAB Agency.
- H. Check locations of all sensors, thermostats, etc., for potential erratic operation from outside influences such as sunlight, drafts, or cold walls.
- I. Verify the operation of all interlocked systems.
- J. Verify that all controller set points meet the design intent.
- K. Perform all system verification to assure the safety of the system and its components.

3.05 SYSTEM PERFORMANCE VERIFICATION

- A. At the time of final inspection, the Test and Balance Contractor shall recheck, in the presence of the owner's representative random selections of data, air and hydronic quantities and other items recorded in the Certified Report.
- B. Points and areas for recheck will be selected by the Owner's representative and shall not exceed 25 percent of the total number tabulated in the Certified Report.
- C. If random tests indicate a measured deviation in air or hydronic flow of ten percent or more from that recorded in the Certified Report, the complete report is rejected, all systems shall be readjusted and tested, new data recorded, new Certified Reports prepared and submitted, and new inspection tests made, all at no additional cost to the owner.
- D. Following system verification of the Certified Report by the Owner's Representative, the settings of all valves, splitter dampers, and other devices shall be permanently marked by the Test and Balance Agency, so that adjustment can be restored if disturbed at any time. Devices shall not be marked until after system verification.

3.06 OPPOSITE SEASON TEST

- A. Testing and Balancing Agency shall perform an inspection of the HVAC system during the opposite season from that in which the initial adjustments were made. The TAB Agency shall make any necessary modifications to the initial adjustments to produce optimum system operation.

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- B. The Contractor shall resubmit six (6) copies of the complete test and balance reports to the Engineer for approval prior to final acceptance of the project.

END OF SECTION 23 0593

SECTION 23 0700
HVAC INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Insulation Materials:
 - a. Mineral fiber.
 - b. Polyisocyanurate.
 - c. Polyolefin.
 - 2. Fire-rated insulation systems.
 - 3. Insulating cements.
 - 4. Adhesives.
 - 5. Sealants.
 - 6. Factory-applied jackets.
 - 7. Field-applied jackets.
 - 8. Tapes.
- B. Related Sections:
 - 1. Division 22 Section "Plumbing Insulation."
 - 2. Division 23 Section "Metal Ducts" for duct liners.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

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- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.06 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.07 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements:
 - a. CertainTeed Corp.; Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Duct Wrap.
 - d. Owens Corning; All-Service Duct Wrap.

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- G. Duct Internal Lining
1. All supply & return ductwork a min. of 10 feet from unit or greater as indicated on floor plans shall be insulated internally with 1.5" thick, 3.0 lb. / cu. ft. density with an "R" value of 6, acoustical duct liner with an acrylic coating on the air stream side that will not support or promote fungal or bacterial growth as rated in accordance with ASTM C 1071, G21 & G22. Acrylic coating shall be treated with an EPA registered anti-microbial agent. Insulation conductivity, or "K" value, shall not exceed 0.25 BTU/In. sq. ft. per degree F per hour at 75 degrees F per ASTM C 158. The lining noise reduction coefficient shall be a min. of 0.70 based on "Type A mounting" as tested in accordance with ASTM C 423. Insulation shall be rated for a minimum velocity to prevent surface fiber erosion of 4,000 FPM.
 2. All exterior supply and return ductwork shall be lined with 2-1/2" insulation liner, which shall have a minimum "R" value of 8.
- H. Polyisocyanurate: Unfaced, preformed, rigid cellular polyisocyanurate material intended for use as thermal insulation.
1. Products: Subject to compliance with requirements:
 - a. Apache Products Company; ISO-25.
 - b. Dow Chemical Company (The); Trymer.
 - c. Duna USA Inc.; Corafoam.
 - d. Elliott Company; Elfoam.
 2. Comply with ASTM C 591, Type I or Type IV, except thermal conductivity (k-value) shall not exceed 0.19 Btu x in./h x sq. ft. x deg F at 75 deg F after 180 days of aging.
 3. Flame-spread index shall be 25 or less and smoke-developed index shall be 50 or less for thickness up to 1-1/2 inches as tested by ASTM E 84.
 4. Fabricate shapes according to ASTM C 450 and ASTM C 585.
- I. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.
1. Products: Subject to compliance with requirements,:
 - a. Armacell LLC; Tubolit.
 - b. Nomaco Inc.; IMCOLOCK, IMCOSHEET, NOMALOCK, and NOMAPLY.
 - c. RBX Corporation; Therma-cell.
- J. Mineral-Fiber, Preformed Pipe Insulation:
1. Products:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000 Pipe Insulation.
 - d. Owens Corning; Fiberglas Pipe Insulation.
 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

2.02 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Insulco, Division of MFS, Inc.; Triple I.
 - b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.

2.03 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Cellular-Glass, Phenolic, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F .
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Products, Division of ITW; CP-96.
 - b. Foster Products Corporation, H. B. Fuller Company; 81-33.
- C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 - 1. Products: Subject to compliance with requirements:
 - a. Aeroflex USA Inc.; Aero seal.
 - b. Armacell LCC; 520 Adhesive.
 - c. Foster Products Corporation, H. B. Fuller Company; 85-75.
 - d. RBX Corporation; Rubatex Contact Adhesive.
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products: Subject to compliance with requirements:
 - a. Childers Products, Division of ITW; CP-82.
 - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
 - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
 - d. Marathon Industries, Inc.; 225.
 - e. Mon-Eco Industries, Inc.; 22-25.
- E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. Products: Subject to compliance with requirements:
 - a. Childers Products, Division of ITW; CP-82.
 - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
 - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
 - d. Marathon Industries, Inc.; 225.
 - e. Mon-Eco Industries, Inc.; 22-25.

2.04 SEALANTS

- A. Joint Sealants:
 - 1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements,:
 - a. Childers Products, Division of ITW; CP-76.
 - b. Foster Products Corporation, H. B. Fuller Company; 30-45.
 - c. Marathon Industries, Inc.; 405.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Pittsburgh Corning Corporation; Pittseal 444.
 - f. Vimasco Corporation; 750.
 - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 3. Permanently flexible, elastomeric sealant.
 - 4. Service Temperature Range: Minus 100 to plus 300 deg F .
 - 5. Color: White or gray.

- B. FSK and Metal Jacket Flashing Sealants:
 - 1. Products: Subject to compliance with requirements:
 - a. Childers Products, Division of ITW; CP-76-8.
 - b. Foster Products Corporation, H. B. Fuller Company; 95-44.
 - c. Marathon Industries, Inc.; 405.
 - 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 3. Fire- and water-resistant, flexible, elastomeric sealant.
 - 4. Service Temperature Range: Minus 40 to plus 250 deg F .
 - 5. Color: Aluminum.

2.05 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 - 3. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.06 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. Metal Jacket:
 - 1. Products: Subject to compliance with requirements:
 - a. Childers Products, Division of ITW; Metal Jacketing Systems.
 - b. PABCO Metals Corporation; Surefit.
 - c. RPR Products, Inc.; Insul-Mate.
 - 2. Aluminum Jacket: Comply with ASTM B 209 , Alloy 3003, 3005, 3105 or 5005, Temper H-14.
 - a. Sheet and roll stock ready for shop or field sizing.
 - b. Finish and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
 - d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
 - e. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.07 TAPES

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- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Products: Subject to compliance with requirements,:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
 - b. Compac Corp.; 104 and 105.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 2. Width: 3 inches .
 3. Thickness: 11.5 mils .
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Products: Subject to compliance with requirements,:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - b. Compac Corp.; 110 and 111.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
 - d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
 2. Width: 3 inches .
 3. Thickness: 6.5 mils .
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Products: Subject to compliance with requirements,:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - b. Compac Corp.; 120.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
 - d. Venture Tape; 3520 CW.
 2. Width: 2 inches .
 3. Thickness: 3.7 mils .
 4. Adhesion: 100 ounces force/inch in width.
 5. Elongation: 5 percent.
 6. Tensile Strength: 34 lbf/inch in width.
- D. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.
 2. Width: 3 inches .
 3. Film Thickness: 4 mils .
 4. Adhesive Thickness: 1.5 mils .
 5. Elongation at Break: 145 percent.
 6. Tensile Strength: 55 lbf/inch in width.
- E. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

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1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Chemical Company (The); Saran 560 Vapor Retarder Tape.
2. Width: 3-inches.
3. Film Thickness: 6 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lb.-f/inch in width.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.03 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

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- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during storage, application and finishing. Insulation that gets wet shall be replaced.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2-inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4-inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

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- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Manholes.
 - 5. Handholes.
 - 6. Cleanouts.

3.04 PENETRATIONS

- A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2-inches.
 - 4. Seal jacket to wall flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2-inches .
 - 1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

3.05 MINERAL-FIBER INSULATION INSTALLATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with staples, tape, and stainless steel wire.
 - 1. All ducts with dimensions exceeding 18" shall have insulation secured with stainless steel wire wrapped on 4' centers
 - 2. For ducts and plenums, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the

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surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3-inches.

3. Overlap un-faced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
4. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
5. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.06 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return.
4. Indoor, exposed return.
5. All duct associated with energy recovery unit.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.07 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. All return air, outdoor air intake, supply air, ERU supply, ERU return and any ducts with an internal temperature below 65 degrees F shall be insulated with mineral-fiber blanket: 2" thick and 0.75 lb/ft³ nominal density.

3.8 PIPING INSULATION

- A. All HVAC piping, other than heat pump loop piping, shall be insulated with minimum ½"-thickness fiberglass or flexible elastomeric insulation unless noted otherwise below.
- B. Condensate below 60 Deg F:
 1. All Pipe Sizes: Insulation shall be the following:
 - a. Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.
 - b.
- C. Refrigerant Suction and Hot-Gas Tubing:
 1. All Pipe Sizes: Insulation shall be the following:
 - a. Flexible Elastomeric: 1 inch thick.
 - b. Polyolefin: 1 inch thick.

3.08 GENERAL PIPE INSULATION INSTALLATION

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- A. Requirements in this Article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

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1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

END OF SECTION 23 0700

**SECTION 15900
HVAC CONTROLS**

PART 1 - GENERAL

1.1 OVERVIEW

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.
- B. This document contains the specification and input/output summaries for a Building Automation System (BAS) for: **Walker County Board of Education**
- C. The system shall provide the Direct Digital Control (DDC), Energy Management and Building Automation System (BAS) for the air conditioning, heating and ventilating systems and shall interface with other microprocessor based building subsystems as detailed in the Input/Output Summaries and as specified herein. All damper and valve actuators shall be electronic.

1.2 INSTRUCTIONS TO BIDDERS

- A. The system specified in this document shall be native BACnet architecture providing full operator access via the Internet or Local Area Network utilizing only a browser for full operator access and control in through a thin-client architecture. The system shall be the **Automated Logic WebCTRL system furnished and installed by ALC Controls Inc.** The requirements are described in this specification. No deviations from this specification are acceptable.

1.3 SCOPE OF WORK

- A. Contractor's Responsibilities
 - 1. The Contractor shall furnish and install all necessary software and hardware, wiring, and computing equipment in compliance with this specification. Any variances from this specification or related documentation shall be submitted in writing at the time of bid.
- B. System Requirements
 - 1. Standard Material/Products. All material and equipment used shall be standard components, regularly manufactured and available, and not custom designed especially for this project
 - 2. Modular Design. The system architecture shall be fully modular permitting expansion of application software, system peripherals, and field hardware.
 - 3. Performance. The system, upon completion of the installation and prior to acceptance of the project, shall perform all operating functions as detailed in this specification.
- C. Equipment
 - 1. System Hardware
 - a. The Contractor shall provide the following:
 - 1) PC's, server(s), routers, modems and control modules as specified.
 - 2) All sensing devices, relays, switches, indicating devices, and transducers required to perform the functions as listed in the sequence of operations.
 - 3) All monitoring and control wiring.
 - 2. System Software
 - a. The Controls Contractor shall provide all software identified in Part 2 of this specification, including the BAS Server, fully configured database, graphics, reports, alarm/events. The Graphical User Interface (GUI) shall be completely Web based as specified herein.

- D. Codes and Regulations
1. Standards Authority. All electrical equipment and material, and its installation, shall conform to the current requirements of the following authorities:
 - a. Occupational Safety and Health Act (OSHA)
 - 1) National Electric Code (NEC)
 - 2) National Fire Code
 - 3) Uniform Mechanical Code
 - 4) Uniform Building Code
 - 5) Uniform Plumbing Code
 2. Product Applicable Standards. All distributed, standalone and unitary controllers supplied shall be in compliance with the following listings and standards:
 - a. UL916 for Open Energy Management (for U.S. and Canada)
 - b. FCC Part 15, Sub-Part B, Class A
 - c. CE Electro Magnetic Compatibility
 3. Manufacturer's Quality System. The control system manufacturer shall be ISO9001 listed for design and manufacture of environmental control systems for precise control and comfort, indoor air quality, HVAC plant operation, energy savings and preventative maintenance. ISO Certification shall be by a registrar that is accredited by an internationally recognized organization such as RAB. Copy of ISO9001 certificate shall be submitted with bid.
 4. Conflict of Codes. Where two or more codes conflict, the most restrictive shall apply. Nothing in this specification or related documentation shall be construed to permit work not conforming to applicable codes.

1.4 GENERAL CONDITIONS

- A. Changes in Scope of Work
1. Any changes in the scope of work must be authorized by a written Change Order.
 2. Correction of Work
 - a. Contractor's Responsibility. The Contractor shall promptly correct all work found defective or failing to conform to the Contract Documents. The Contractor shall bear all cost of correcting such work.
 - b. During Warranty. If, within the warranty period required by the Contract Documents, any of the work is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice to do so.
- B. Coordination of Work During Construction
1. The Contractor shall coordinate any necessary changes in work scheduling to minimize disruption.
 2. The Contractor shall protect the installed works by other trades.
 - a. The Contractor shall coordinate with other trades.
 - b. The Contractor shall repair any damage caused by his work to building(s) and equipment at no additional cost to the owner.
- C. Warranty
1. The Contractor shall warrant, from the date of final acceptance, that all systems, subsystems, component parts, and software are fully free from defective design, materials, and workmanship for a period of one year or longer as indicated in this specification.
 2. In addition, contractor shall provide an additional 5-year parts warranty on all energy management system components.

1.5 SUBMITTALS, DOCUMENTATION, ACCEPTANCE AND TRAINING

- A. Submittals

1. Shop Drawings. A minimum of seven (7) copies of shop drawings shall be submitted and shall consist of a complete list of equipment, materials, manufacturer's technical literature, cut-sheets, and installation instructions. Drawings shall contain proposed layout, complete wiring, routing, schematic diagrams, tag number of devices, software descriptions, calculations, installation details, and any other details required to demonstrate that the system will function properly.
 2. Graphical Programming Documentation: The Contractor shall provide a printout all Graphical Programs, identifying the specific HVAC or mechanical/electrical subsystem being controlled
 3. Drawing Approval. Shop drawings shall be approved before any equipment is installed. Controls contractor shall allow a minimum of fourteen (14) days for drawing approval.
 4. As Built Drawings. All drawings shall be reviewed after the final system checkout and updated or corrected to provide 'as-built' drawings to show exact installation. All shop drawings will be acknowledged in writing before installation is started and again after the final checkout of the system. The system will not be considered complete until the 'as-built' drawings have received their final approval. The Contractor shall deliver 6 sets of 'as-built' drawings.
- B. Documentation
1. Operating and Maintenance (O&M) manuals for the system shall be made available electronically using Acrobat (PDF) format and include the following categories: Workstation User's Manual, Project Engineering Handbook, Software Documentation.
 2. BAS User's Manual shall contain as a minimum:
 - a. System overview
 - b. Networking concepts
 - c. Launching a web browser from a networked PC/PDA and login
 - d. Graphical User Interface (GUI) screen menus and their definitions
 - e. Creating, modifying or deleting schedules
 - f. Uploading and downloading software to the field hardware
 - g. Creating historical trends, collecting trend data and generating trend graphs
 - h. Enabling and assigning alarms and messages to reporting actions/groups
 - i. Report generation and 'third party software'
 - j. Backing up software and data files
 3. Project Engineering Manual shall contain as a minimum:
 - a. System architecture overview
 - b. Hardware cut-sheets and product descriptions
 - c. The Contractor shall deliver six (6) sets of 'as-built' drawings. All drawings shall be reviewed after the final system checkout and updated to provide 'as-built' drawings. The system will not be considered complete until the 'as-built' drawings have received their final approval.
 - d. Installation, mounting and connection details for all field hardware and accessories
 - e. Commissioning, setup and backup procedures for all control modules/accessories, BAS server software, and database.
 - f. Listing of basic terminology, alarms/messages, error messages and frequently used commands or shortcuts.
 4. BAS Software Documentation shall contain as a minimum:
 - a. The Contractor shall provide a printout all Graphical Programs, detailing their application to specific HVAC equipment and electrical/mechanical subsystems, together with a glossary or icon symbol library detailing the function of each graphical icon. Revisions made as a result of the submittal process, during the installation, start-up or acceptance portion of the project, shall be accurately reflected in the "as-builts".
 - b. Graphical representation of the mechanical equipment hierarchy for the project including all equipment controlled by the BAS. For example: a VAV terminal box may be the source for increased cooling demand and require the primary VAV AHU to operate which, in turn, requires the chillers to operate.
 - c. Detailed listing of all alarm and event messages programmed for designated mechanical/electrical equipment and required operator action.

- C. Acceptance Test
 - 1. Acceptance Testing. Upon completion of the installation, the Contractor shall start up the system and perform all necessary calibration, testing, and debugging operations. The Contractor in the presence of the Owner's representative shall perform an acceptance test.
 - 2. Notice of Completion. When the system performance is deemed satisfactory, the system parts will be accepted for beneficial use and placed under warranty. At this time, a "notice of completion" shall be issued and the warranty period shall start.
- D. System Training
 - 1. System Use Instructions: Controls Contractor shall provide 24 Hours of training for designated personnel in the operation, maintenance, and programming of the system.

PART 2 - PRODUCTS - BAS SERVER & WEB BROWSER GUI

2.1 SYSTEM OVERVIEW

- A. The BAS contractor shall provide system software based on a server/thin-client architecture, designed around the open standards of web technology. The BAS server shall communicate using ASHRAE's BACnet/IP protocol. Server shall be accessed using a web browser over the DDC system intranet provided under this contract and remotely over the Internet.
- B. The intent of the thin-client architecture is to provide the operator(s) complete access to the BAS system via a web browser. The thin-client web browser Graphical User Interface (GUI) shall be browser and operating system agnostic, meaning it will support Microsoft Internet Explorer browsers (6.x or later versions), and Windows as well as non-Windows operating systems. No special software, (active-x components or fat java clients) shall be required to be installed on the PC's / PDA's used to access the BAS via a web browser.
- C. The BAS server software must support at least the following server platforms (Windows NT, Sun Solaris and Linux). The BAS server software shall be developed and tested by the manufacturer of the system standalone controllers and network controllers/routers. Third party manufactured and developed BAS software is not acceptable.
- D. The web browser GUI shall provide a completely interactive user interface and must offer the following features as a minimum:
 - Trending
 - Scheduling
 - Downloading Memory to field devices
 - Real time 'live' Graphic Program Diagnostics for troubleshooting
 - Tree Navigation
 - Parameter change of properties
 - Setpoint Adjustments
 - Alarm / Event information
 - Configuration of operators
 - Execution of global commands
- E. Software Components
 - 1. All software components of the BAS system software shall be installed and completed in accordance with the specification. BAS system components shall include:
 - a. Server Software, Database and Web Browser Graphical User Interface
 - b. System Configuration Utilities for future modifications to the system
 - c. Graphical Programming

- d. Direct digital control software
 - e. Application Software
- F. BAS Server Database
- 1. The BAS server software shall utilize a Java DataBase Connectivity (JDBC) compatible database such as: MS Access, MS SQL 7.0, Oracle 8i or IBM DB2. BAS systems written to Proprietary databases are **NOT** acceptable.
- G. Database Open Connectivity
- 1. The BAS server database shall be Java DataBase Connectivity (JDBC) compatible, allowing real time access of data via the following standard mechanisms:
 - a. Common Object Request Broker Architecture (CORBA)
 - b. OLE/OPC (for Microsoft Client's/Server platform only)
 - c. Import/Export of the database from or to XML (extensible Mark-up Language)
- H. Communication Protocol(s)
- 1. The native protocol for the BAS server software shall be BACnet as defined by ASHRAE standard SPC135. In addition, the software shall be able to support concurrent operation of multiple standard and non-standard protocols such as:
 - a. MODBUS
 - b. SMNP
- I. Cross Platform Capability
- 1. The BAS system software (client and server) shall be operating system and hardware agnostic, being able to run on Windows 98, Windows 2000, Windows NT, Sun Microsystems Solaris and Red Hat Linux
- J. Thin Client – Web Browser Based
- 1. The GUI shall be thin client or browser based and shall meet the following criteria:
 - a. Web Browser's for PC's: Only a 6.x browser (Explorer/Navigator) will be required as the GUI, and a valid connection to the server network. No installation of any custom software shall be required on the operator's GUI workstation/client. Connection shall be over an intranet or the Internet. A firewall shall be installed (as necessary) to protect the customer's Intranet.
 - b. Secure Socket Layers: Communication between the Web Browser GUI and BAS server shall be encrypted using 128-bit encryption technology within Secure Socket Layers (SSL). Communication protocol shall be Hyper-Text Transfer Protocol (HTTP).
 - c. PDA's: BAS Server software must support other browsers used by Personal Digital Assistants like 3Com Palm Pilots and other Internet appliances specified herein.

2.2 WEB BROWSER GRAPHICAL USER INTERFACE

A. Web Browser Navigation

- 1. The Thin Client web browser GUI shall provide a comprehensive user interface. Using a collection of web pages, it shall be constructed to "feel" like a single application, and provide a complete and intuitive mouse/menu driven operator interface. It shall be possible to navigate through the system using a web browser to accomplish **2.2 B thru 2.2 J** of this specification. The Web Browser GUI shall (as a minimum) provide a Navigation Pane for navigation, and a Action Pane for display of animated graphics, schedules, alarms/events, live graphic programs, active graphic setpoint controls, configuration menus for operator access, reports, and reporting actions for events.

B. Login

- 1. On launching the web browser and selecting the appropriate domain name or IP address, the operator shall be presented with a login page that will require a login name and password.

Navigation in the system shall be dependent on the operator's role privileges, and geographic area of responsibility (see 3.2 J below).

C. Navigation Pane

1. The Navigation Pane shall comprise a Navigation Tree which defines a geographic hierarchy of the proposed BAS system. Navigation through the GUI shall be accomplished by clicking on appropriate level of a navigation tree (consisting of expandable and collapsible tree control like Microsoft's Explorer program), and/or by selecting dynamic links to other system graphics. Both the navigation tree and graphic pane defined in 2.2 D shall be displayed simultaneously, enabling the operator to select a specific system or equipment, and view the graphic corresponding to the highlighted position in the navigation tree. The navigation tree shall as a minimum provide the following views: Geographic, Network, Groups and Configuration.
2. Geographic View shall display a logical geographic hierarchy of the system including cities, sites, buildings, building systems, floors, equipment and BACnet objects.
3. Network View shall display the hierarchy of the actual BACnet IP Intranet network. This can include: Systems, Site, Networks, Routers, Half-Routers, Devices, Equipment and all the BACnet Objects in a device.
4. Groups View shall display Scheduled Groups and custom reports.
5. Configuration View shall display all the configuration categories (Operators, Schedule, Event, Reporting and Roles).

D. Action Pane

1. The Action Pane shall provide several functional views for each HVAC or mechanical/electrical subsystem specified. By clicking on a button, an operator shall be able to select the following system page, corresponding to the highlighted area/equipment in the navigation tree:
2. Graphics: Using animated gifs or other graphical format suitable for display in a web browser, graphics shall include aerial building/campus views, color building floor-plans, equipment drawings of each individual piece of equipment with live variable statuses, active graphic setpoint controls, web content, and other valid HTML elements. The data on each graphic page shall automatically refresh at a rate defined by the operator.
3. Properties: Shall include graphic controls and text for the following: Locking or overriding BACnet objects, demand strategies, and any other valid data required for setup. Changes made to the properties pages shall require the operator to depress a 'accept/cancel' button.
4. Schedules: Shall be used to create, modify/edit and view schedules based on the systems geographical hierarchy (using the navigation tree) and in compliance with section 2.2.G
5. Events: Shall be used to view alarm event information geographically (using the navigation tree), acknowledge events, sort events by category, actions and verify reporting actions.
6. Trends: Shall be used to display associated trend and historical data, modify colors, date range, axis and scaling
7. Logic - Live Graphic Programs: Shall be used to display a 'live' graphic programs of the control algorithm for the mechanical/electrical system selected in the navigation tree. All control outputs and inputs shall displayed on the program giving real-time statuses for use in operator troubleshooting.

E. The following actions shall be accomplished by clicking appropriate buttons/menu's in the graphic window: Log In/Out, Print and Hide/Show Navigation Pane.

1. Color Graphics

- a. The Web Browser GUI shall make extensive use of color in the graphic pane to communicate information related to setpoints and comfort. Animated gif's, active setpoint graphic controls and valid web content (like local weather forecast) shall be used to enhance usability:
- b. Display Size: The GUI workstation software shall graphically display in 1024 by 768 pixels 24 bit True Color.

- c. General Graphic: General area maps shall show locations of controlled buildings in relation to local landmarks.
 - d. Color Floor Plans: Floor plan graphics shall show heating and cooling zones throughout the buildings in a range of colors, which provide a visual display of temperature relative to their respective setpoints (see section 3.2 F below). The colors shall be updated dynamically as a zone's actual comfort condition changes in real-time. Locations of space sensors shall also be shown for each zone. The intent of the specification is to enable the operator to readily assess problems at a glance.
 - e. Mechanical Components: Mechanical system graphics shall show the type of mechanical system components serving any zone through the use of a pictorial representation of components. Selected I/O points being controlled or monitored for each piece of equipment shall be displayed with the appropriate engineering units. Animation shall be used for rotation or moving mechanical components to enhance usability.
 - f. Minimum System Color Graphics: Color graphics shall be selected and displayed via a web browser for the following:
 - 1) Each piece of equipment monitored or controlled including each terminal unit
 - 2) Each building
 - 3) Each floor and zone controlled
- F. Zone Setpoint Adjustments
- 1. Color floor plans displayed via a web browser shall utilize a contiguous band of colors, each corresponding to actual zone temperatures relative to the desired heating and cooling setpoints. The ideal temperature shall be shown as a green color band. Temperatures slightly warmer than ideal shall be shown in yellow, and even warmer temperature band shall be shown in orange. Temperatures slightly cooler than ideal shall be light blue, and even cooler temperatures shall be shown as dark blue. All alarm colors shall be in red.
- G. Hierarchical Schedules
- 1. Utilizing the Navigation Tree displayed in the web browser GUI, an operator (with password access) shall be able to define a Normal, Holiday or Override schedule for an individual piece of equipment or room, or choose to apply a hierarchical schedule to the entire system, site or floor area.
 - 2. All schedules that affect the system/area/equipment highlighted in the Navigation Tree shall be shown in a summary schedule table and graph.
- H. BACnet Schedules: Schedules shall comply with the BACnet standard, (Schedule Object, Calendar Object, Weekly Schedule property and Exception Schedule property) and shall allow events to be scheduled based on:
- 1. Types of schedule shall be Normal, Holiday or Override
 - 2. A specific date,
 - 3. A range of dates,
 - 4. Any combination of Month of Year (1-12, any), Week of Month (1-5, last, any), Day of Week (M-Sun, Any)
 - 5. Wildcard (example, allow combinations like second Tuesday of every month).
- I. Schedule Categories: The system shall allow operators to define and edit scheduling categories (different types of “things” to be scheduled; for example, lighting, HVAC occupancy, etc.). The categories shall include name, description, icon (to display in the hierarchy tree when icon option is selected) and type of value to be scheduled.
- J. Schedule Groups: In addition to hierarchical scheduling, operators shall be able to define functional Schedule Groups, comprised of an arbitrary group of areas/rooms/equipment scattered throughout the facility and site. For example, the operator shall be able to define an ‘individual tenant’ group – who may occupy different areas within a building or buildings. Schedules applied to the ‘tenant group’ shall automatically be downloaded to control modules affecting spaces occupied by the ‘tenant group’

- K. Intelligent Scheduling: The control system shall be intelligent enough to automatically turn on any supporting equipment needed to control the environment in an occupied space. If the operator schedules an individual room in a VAV system for occupancy, the control logic shall automatically turn on the VAV air handling unit, chiller, boiler, and/or any other equipment required to maintain the specified comfort and environmental conditions within the room.
- L. Partial Day Exceptions: Schedule events shall be able to accommodate a time range specified by the operator.
- M. Schedule Summary Graph: The schedule summary graph shall clearly show Normal versus Holiday versus Override Schedules, and the net operating schedule that results from all contributing schedules. Note: In case of priority conflict between schedules at the different geographic hierarchy, the schedule for the more detailed geographic level shall apply.
- N. Schedule Distribution: For reliability and performance, instead of maintaining a single schedule in a field device that writes over the network to notify other devices when a scheduled event occurs, field devices will only keep their part of the schedule locally. The BAS server software shall determine which nodes a hierarchical schedule applies to and will create/modify the necessary schedule objects in each field device as necessary.
- O. Events (& Alarms)
1. Events and alarms associated with a specific system, area, or equipment selected in the Navigation Tree, shall be displayed in the Action Pane by selecting an 'Events' view. Events, alarms, and reporting actions shall have the following capabilities:
 - a. Events View: Each event shall display an Event Category (using a different icon for each event category), date/time of occurrence, current status, event report, and a URL link to the associated graphic for the selected system, area or equipment. The URL link shall indicate the system location, address and other pertinent information. An operator shall easily be able to sort events, edit event templates and categories, acknowledge or force a return to normal in the Events View as specified in this section.
 - b. Event Categories: The operator shall be able to create, edit or delete event categories such as HVAC, Maintenance, Fire, or Generator. An icon shall be associated with each Event category, enabling the operator to easily sort through multiple events displayed using a built-in filter.
 - c. BACnet Event Templates: BACnet Event template shall define different types of alarms and their associated properties. As a minimum, properties shall include a reference name, verbose description, severity of event, acknowledgement requirements, high/low limit and out of range information.
 - d. Event Areas: Event Areas enable an operator to assign specific Event Categories to specific Event Reporting Actions.
 - e. Event Time/Date Stamp: All events shall be generated at the DDC control module level and comprise the Time/Date Stamp using the standalone control module time and date.
 - f. Event Configuration: Operators shall be able to define the type of events generated per BACnet object. A 'network' view of the Navigation Tree shall expose all BACnet objects and their respective Event Configuration. Configuration shall include assignment of event, alarm, type of Acknowledgement and notification for return to normal or fault status.
 - g. Event Summary Counter: The view of events in the Graphic Pane shall provide a numeric counter, indicating how many events are active (in alarm), require acknowledgement, and total number of events in the BAS Server database.
 - h. Persistent Data. The system shall allow for external systems to access the event instance data. Event data shall be stored and queried in the database in a relational manner. At a minimum, the fields to be stored in the database are:
 - Event Source
 - Classification of Event
 - Event Generation Time
 - Event Acknowledgement

Walker County Schools Gymnasium HVAC Modifications
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- Acknowledge Required Flag
- Delivery Priority
- BACnet Event Type
- Event Message Text
- BACnet Event Parameter
- Time
- Return to Normal Time
- Operator Comments
- Who Acknowledged the Event

- i. Event Auto-Deletion: Events that are acknowledged and closed shall be auto-deleted from the database and archived to a text file after an operator defined period.
- j. Event Reporting Actions: Event Reporting Actions specified shall be automatically launched (under operator defined conditions) after an event is received by the BAS server software. Operators shall be able to fully define these Reporting Actions using the Navigation Tree and Graphic Pane in the web browser GUI. Reporting Actions shall be as follows:
 - 1) Print: Alarm/Event information shall be printed to the BAS server's PC or a networked printer.
 - 2) Email: Email shall be sent via any POP3-compatible e-mail server (most Internet Service Providers use POP3). Email messages may be copied to several email accounts.
2. **Note:** Email reporting action shall also be used to support alphanumeric paging services, where email servers support pagers.
 - a. File Write: The ASCII File write reporting action shall enable the operator to append operator defined alarm information to any alarm through a text file. The alarm information that is written to the file shall be completely definable by the operator. The operator may enter text or attach other data point information (such as AHU discharge temperature and fan condition upon a high room temperature alarm).
 - b. Write Property: The write property reporting action updates a property value in a hardware module.
 - c. SNMP: The Simple Network Management Protocol (SNMP) reporting action sends an SNMP trap to a network in response to receiving an event.
 - d. Run External Program: The Run External Program reporting action launches specified program in response to an event.
3. Event Simulator: The web browser GUI user shall provide an Event Simulator to test assigned Reporting Actions. The operator shall have the option of using current time or scheduling a specific time to generate the Event. Utilizing the Navigation Tree and drop-down menus in the Graphic Pane, the operator shall be able to select the Event Type, Status, Notification, Priority, Message, and whether acknowledgement is required.
4. External Injection of Events. The BAS server software shall provide a CORBA interface for external injection of events, allowing the system to receive/report events generated from external source other than the BAS system.

P. Trends

1. Trends shall conform to the BACnet Trend Log Object specification. The system shall be able to trend and display graphically all analog, digital or calculated points simultaneously. A trend log's properties shall be editable using the Navigation Tree and Graphic Pane.
2. Viewing Trends: The operator shall have the ability to view trends by using the Navigation Tree and selecting a Trends button in the Graphic Pane. The system shall allow y- and x-axis maximum ranges to be specified and shall be able to simultaneously graphically display multiple trends per graph.
3. Local Trends: Trend data shall be collected locally by Multi-Equipment/Single Equipment general-purpose controllers, and periodically uploaded to the BAS server if historical trending is enabled for the BACnet object. Trend data, including run time hours and start time date shall be retained in non-volatile module memory
4. Resolution. Sample intervals shall be as small as one (0.1) second. Each trended point will have the ability to be trended at a different trend interval. When multiple points are selected for display that have different trend intervals, the system will automatically scale the axis.
5. Dynamic Update. Trends shall be able to dynamically update at operator-defined intervals.

6. Zoom. It shall be possible to zoom-in on a particular section of a trend for more detailed examination.
7. Numeric Value Display. It shall be possible to pick any sample on a trend and have the numerical value displayed.

Q. Security Access

1. Systems that Security access from the web browser GUI to BAS server shall require a Login Name and Password. Access to different areas of the BAS system shall be defined in terms of Roles, Privileges and geographic area of responsibility as specified:
 - a. Roles: Roles shall reflect the actual roles of different types of operators. Each role shall comprise a set of easily understood English language' privileges. Roles shall be defined in terms of View, Edit and Function Privileges. Systems that use cryptic Boolean numbers to define system access are not acceptable.
 - 1) View Privileges shall comprise Navigation, Network, and Configuration Trees, Operators, Roles and Privileges, Alarm/Event Template and Reporting Action.
 - 2) Edit Privileges shall comprise Setpoint, Tuning and Logic, Manual Override, and Point Assignment Parameters.
 - 3) Function Privileges shall comprise Alarm/Event Acknowledgement, Control Module Memory Download, Upload, Schedules, Schedule Groups, Manual Commands, Print, and Alarm/Event Maintenance.
2. Geographic Assignment of Roles: Roles shall be geographically assigned using a similar expandable/collapsible navigation tree.

2.3 GRAPHICAL PROGRAMMING

- A. The system software shall include a Graphic Programming Language (GPL) for all DDC control algorithms resident in standalone control modules. Any system that does not use a drag and drop method of graphical icon programming as described herein shall be unacceptable. GPL is a method used to create a sequence of operations by assembling graphic microblocks that represent each of the commands or functions necessary to complete a control sequence of operation. Microblocks represent common logical control devices used in conventional control systems, such as relays, switches, high signal selectors, etc., in addition to the more complex DDC and energy management strategies such as PID loops and optimum start. Each microblock shall be interactive and contain the programming necessary to execute the function of the device it represents.
- B. Graphic programming shall be performed while on screen and using a mouse; each microblock shall be selected from a microblock library and assembled with other microblocks necessary to complete the specified sequence. Microblocks are then interconnected on screen using graphic "wires," each forming a logical connection. Once assembled, each logical grouping of microblocks and their interconnecting wires then forms a graphic function block which may be used to control any piece of equipment with a similar point configuration and sequence of operation.
- C. Graphic Sequence
 1. The clarity of the graphic sequence must be such that the operator has the ability to verify that system programming meets the specifications, without having to learn or interpret a manufacturer's unique programming language. The graphic programming must be self-documenting and provide the operator with an understandable and exact representation of each sequence of operation.
- D. Simulation
 1. Full simulation capability shall be provided with the graphic programming. Operator shall be able to fully simulate the constructed control sequence prior to downloading into field control modules. Simulation capabilities shall include step-by-step, accelerated time, and operator defined simulation criteria like outside weather, demand, and communication status. Multiple graphic programs shall be simulated and displayed in split screens at the same time.

E. GPL Capabilities

The following is a minimum definition of the capabilities of the Graphic Programming software:

1. Function Block (FB): Shall be a collection of points, microblocks and wires which have been connected together for the specific purpose of controlling a piece of HVAC equipment or a single mechanical system.
2. Logical I/O: Input/Output points shall interface with the control modules in order to read various signals and/or values or to transmit signal or values to controlled devices.
3. BACnet Points: Shall be points that comply with the BACnet structure as defined in the BIBB's Addendum B1/B2, and the BACnet standard.
4. Microblocks: Shall be software devices that are represented graphically and may be connected together to perform a specified sequence. A library of microblocks shall be submitted with the control contractors bid.
5. Wires: Shall be graphical elements used to form logical connections between microblocks and between logical I/O. Different wire types shall be used depending on whether the signal they conduct is analog or digital.
6. Labels: Labels shall be similar to wires in that they are used to form logical connections between two points. Labels shall form a connection by reference instead of a visual connection; i.e. two points labeled 'A' on a drawing are logically connected even though there is no wire between them.
7. Parameter: A parameter shall be a value that may be tied to the input of a microblock.
8. Properties: Dialog boxes shall appear after a microblock has been inserted which has editable parameters associated with it. Default parameter dialog boxes shall contain various editable and non-editable fields and shall contain 'push buttons' for the purpose of selecting default parameter settings.
9. Icon: An icon shall be graphic representation of a software program. Each graphic microblock has an icon associated with it that graphically describes it function.
10. Menu-bar Icon: Shall be an icon that is displayed on the menu bar on the GPL screen, which represents its associated graphic microblock.
11. Live Graphical Programs: The Graphic Programming software must support a 'live' mode, where all input/output data, calculated data, and setpoints shall be displayed in a 'live' real-time mode. For each piece of HVAC equipment, the graphic program shall be complete and viewed on one screen. For example, a graphic program used for an Air Handling Unit shall not be broken down into separate components and require an operator to view only one component at any one time.

PART 3 - PRODUCTS HARDWARE

3.1 BAS SERVER HARDWARE

A. Computer Configuration (One BAS server to be provided by control contractor under this project, unless there is an existing BAS Server furnished by this Contractor.)

1. Central Server. The BAS Contractor shall provide a server configuration that includes the following components as a minimum:
 - Server Class computer ie: Dell Poweredge SC430
 - Operating system-Windows 2003 Server
 - Processor – 3GHZ P4, minimum 3 GB RAM
 - 80GB HDD, SCSI
 - CD – CDRW
 - 2 Button Mouse
 - 101 keyboard
 - 17" Monitor
 - SVGA Display card capable of 1024 X 768 resolution in true Color (32bit)
 - 10/100 Ethernet NIC
 - IE 6.0 or later

- Database engine – MS Access Db < 500MB, MSDE, MS SQL Server

B. Standard Client (Hardware Independent)

1. The thin-client browser interface shall be hardware agnostic, meaning it will support Microsoft browser (6.x versions) as well as most common server platforms (Windows NT, Sun Solaris and Linux). No special software, (active-x components or fat Java clients) shall be required to be installed on the PC's / PDA's used to access the BAS via a web browser. The following is the minimum suggested hardware requirements for a Windows/Intel client:
 - a. 700Mhz, PIII or higher CPU
 - b. 256Mb of RAM minimum
 - c. 20 gigabyte hard disk, SVGA Card with 1024 x 768, 24-bit True Color, 24X CD Rom Drive, 17" SVGA Color Monitor
 - d. Operating system for the computer operator workstation server shall be Microsoft Windows XP,2000 or RedHat Linux 6.0 or Sun Solaris 7.0
 - e. Internet Explorer 6.x
 - f. Connection to the Intranet/Internet

No client hardware is required under this project if the BAS server can act as client in addition to the BAS server applications. Any owner/customer computers may act as client if the client computer has a 6.X browser and has connection capability to the DDC intranet/server.

3.2 NETWORK ROUTERS & BRIDGES

- A. The DDC/BAS controller network shall use BACnet as its native communication protocol. Network bridges and routers must be of a modular design to ensure reliability and system performance.
 1. BACnet Router
 2. The central system shall use the DDC/BAS Local Area Network (LAN) provided under this contract for communication. The communication between the central server and the controllers shall be BACnet/IP. A router shall be provided, as required, to bridge BACnet/IP and the data link used between the controllers (BACnet ARCNET and BACnet MS/TP). Proprietary networks and proprietary protocols are not acceptable.
 - a. Firmware Updates: The BACnet Router must utilize FLASH memory to allow firmware updates to be performed remotely.

3.3 STANDALONE CONTROLLERS

- A. General Purpose Multiple Application Controllers
 1. BACnet BIBBS: General Purpose Multiple Application controllers must use BACnet as the native communication protocol between controllers.
 2. Communication Speed: Controllers shall communicate at a minimum of 156 Kbps using ARCNET implemented over EIA-485 using an unshielded twisted pair at the Data Link Layer.
- B. General Specification: Each General Purpose Multiple Application Controller must be capable of standalone direct digital operation utilizing its own 32 bit processor, non-volatile flash memory, input/output, 12 bit A to D conversion, hardware clock/calendar and voltage transient and lightning protection devices. A separate co-processor shall be used for communications to the controller network. All non-volatile flash memory shall have a battery backup of at least five years. Firmware revisions to the module shall be made from the BAS server or remotely over the Intranet or Internet. Controllers that require component changes to implement firmware revisions are not acceptable.
- C. Point Expansion: The General Purpose Multiple Application Controllers shall be expandable to the specified I/O point requirements. Each controller shall accommodate multiple I/O Expander Modules via a designated expansion I/O bus port. These expander modules shall expand the total point

capacity of each controller up to 192 points where specified. The controller, in conjunction with the expansion modules, shall act as one standalone controller.

- D. Point Programming: All point data, algorithms and application software within a controller shall be custom programmable from the operator workstation.
- E. Program Execution: Each General Purpose Multiple Application Controller shall execute application programs, calculations, and commands via a 32-bit microcomputer resident in the controller. All operating parameters for application programs residing in each controller shall be stored in read/writable nonvolatile flash memory within the controller and will be able to upload/download to/from the BAS Server.
- F. Self-Test Diagnostics: Each controller shall include self-test diagnostics, enabling the controller to report malfunctions to the router and BAS Server.
- G. PID Loops: Each General Purpose Multiple Application Controller shall contain both software and firmware to perform full DDC Proportional, Integral, Derivative (PID) control loops and programs.
- H. Input-Output Processing:
 - 1. Digital Outputs shall be relays, 24 Volts AC or DC maximum, 3-amp maximum current. Each configured as normally open or normally closed using jumpers and either dry contact or bussed. Each output shall have a manual Hand-Off-Auto switch to allow for override and an LED to indicate the operating mode of the output. Triac outputs are unacceptable.
 - 2. Universal Inputs shall be Thermistor (BAPI Curve II) 10K Ohm at 77°F (25°C), 0-5VDC, 10K Ohm maximum source impedance, 0-20mA - 24 VDC loop power, 250 Ohm input impedance, dry contact - 0.5mA maximum current.
 - 3. Analog Output shall be electronic, voltage mode 0-10VDC or current mode 4-20mA.
- I. General Purpose Single Application Controllers
 - 1. BACnet BIBBS: The General Purpose Single Application Controllers must use BACnet as the native communication protocol between controllers.
 - 2. Communication Speed: Controllers shall communicate at a minimum of 156 Kbps using ARCNET implemented over EIA-485 using an unshielded twisted pair at the Data Link Layer.
 - 3. General Specification: General Purpose Single Application controllers must be capable of stand-alone DDC operation utilizing its own 32 bit processor, nonvolatile flash memory, input/output, 8 bit A to D conversion, hardware clock/calendar and voltage transient protection devices. A separate co-processor shall be used for communications to the controller network. All RAM memory shall have a battery backup of at least five years. Firmware revisions to the module shall be made from the BAS server, or remote locations over the Internet. Controllers that require component changes to implement Firmware revisions are not be acceptable.
 - 4. Point Programming: All point data, algorithms, and application software within the controllers shall be custom programmable from the Operator Workstation.
 - 5. Program Execution: Each General Purpose Single Application Controller shall execute application programs, calculations, and commands via a 32-bit microcomputer resident in the controller. All operating parameters for the application program residing in each controller shall be stored in read/writable nonvolatile flash memory within the controller and will be able to upload/download to/from the Operator Workstation.
 - 6. Self-Test Diagnostics: Each controller shall include self-test diagnostics, enabling the controller to report malfunctions to the router and BAS Server input.
 - 7. PID Loops: Each General Purpose Single Application Controller shall contain both software and firmware to perform full DDC PID control loops.
 - 8. Rooftop Mounting: The General Purpose Single Application Controllers shall be capable of being mounted directly in or on rooftop AHU equipment.

9. Operating Temperature: The General Purpose Single Application Controllers shall be capable of proper operation in an ambient temperature environment of -20°F to +150°F (-28.9° to 65.6°C).
10. Input-Output Processing:
 - a. Digital Outputs shall be relays, 24 Volts AC or DC maximum, 3 amp maximum current. Each output shall have a manual Hand-Off-Auto switch to allow for override and an LED to indicate the operating mode of the output. **Triac outputs are unacceptable.**
 - b. Universal Inputs shall be Thermistor (BAPI Curve II) 10K Ohm at 77°F (25°C), 0-5VDC - 10K Ohm maximum source impedance, 0-20mA - 24 VDC loop power, 250 Ohm input impedance, Dry Contact - 0.5mA maximum current.
 - c. Analog Electronic Outputs shall be voltage mode 0-10VDC or current mode 4-20mA.
 - d. Enhanced Zone Sensor Input shall provide one thermistor input, one local setpoint adjustment, one timed local override switch, and an occupancy LED indicator.

3.4 FIELD HARDWARE/INSTRUMENTATION

A. Temperature Sensing Devices

1. Type & Accuracy. Temperature sensors shall be of the type and accuracy indicated for the application. Sensors shall have an accuracy rating within 1% of the intended use temperature range.
2. Outside Air Temperature Sensors. Outside air temperature sensors accuracy shall be within +1°F (0.5°C) in the range of -52°F to 152°F (-46.6°C to 66.6°C).
3. Room Temperature Sensors. Room temperature sensors shall have an accuracy of +0.36°F (0.25°C) in the range of 32°F to 96°F (0°C to 35.5°C).
4. Chilled Water and Condenser Water Sensors. Chilled water and condenser water sensors shall have an accuracy of +0.25°F (0.15°C) in their range of application.
5. Hot Water Temperature Sensors. Hot water temperature sensors shall have an accuracy of +0.75°F (0.3°C) over the range of their application.

B. Pressure Instruments

1. Differential Pressure and Pressure Sensors: Sensors shall have a 4-20 MA output proportional signal with provisions for field checking. Sensors shall withstand up to 150% of rated pressure, without damaging the device. Accuracy shall be within $\pm 2\%$ of full scale. Sensors shall be manufactured by Leeds & Northrup, Setra, Robertshaw, Dwyer Instruments, Rosemont, or be approved equal.
2. Pressure Switches: Pressure switches shall have a repetitive accuracy of $\pm 2\%$ of range and withstand up to 150% of rated pressure. Sensors shall be diaphragm or bourdon tube design. Switch operation shall be adjustable over the operating pressure range. The switch shall have an application rated Form C, snap-acting, self-wiping contact of platinum alloy, silver alloy, or gold plating.

C. Flow Switches

1. Flow switches shall have a repetitive accuracy of $\pm 1\%$ of their operating range. Switch actuation shall be adjustable over the operating flow range. Switches shall have snap-acting Form C contacts rated for the specific electrical application.

D. Humidity Sensors

1. Sensors shall have an accuracy of $\pm 25\%$ over a range of 20% to 95% RH.

E. Current Sensing Relays

1. Relays shall monitor status of motor loads. Switch shall have self-wiping, snap-acting Form C contacts rated for the application. The setpoint of the contact operation shall be field adjustable.

F. Output Relays

1. Control relay contacts shall be rated for 150% of the loading application, with self-wiping, snap-acting Form C contacts, enclosed in dustproof enclosure. Relays shall have silver cadmium contacts with a minimum life span rating of one million operations. Relays shall be equipped with coil transient suppression devices.
- G. Solid State Relays
1. Input/output isolation shall be greater than 10 billion ohms with a breakdown voltage of 15 V root mean square, or greater, at 60 Hz. The contact operating life shall be 10 million operations or greater. The ambient temperature range of SSRs shall be 20°F-140°F. Input impedance shall be greater than 500 ohms. Relays shall be rated for the application. Operating and release time shall be 10 milliseconds or less. Transient suppression shall be provided as an integral part of the relays.
- H. Valve and Damper Actuators
1. Electronic Direct-Coupled: Electronic direct-coupled actuation shall be provided.
 2. Actuator Mounting: The actuator shall be direct-coupled over the shaft, enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The fastening clamp assembly shall be of a 'V' bolt design with associated 'V' shaped toothed cradle attaching to the shaft for maximum strength and eliminating slippage. Spring return actuators shall have a 'V' clamp assembly of sufficient size to be directly mounted to an integral jackshaft of up to 1.05 inches when the damper is constructed in this manner. Single bolt or screw type fasteners are not acceptable
 3. Electronic Overload Sensing: The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the entire rotation of the actuator. Mechanical end switches or magnetic clutch to deactivate the actuator at the end of rotation are not acceptable.
 4. Power Failure/Safety Applications: For power failure/safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Non-mechanical forms of fail-safe operation are not acceptable.
 5. Spring Return Actuators: All spring return actuators shall be capable of both clockwise or counterclockwise spring return operation by simply changing the mounting orientation.
 6. Proportional Actuators: Proportional actuators shall accept a 0 to 10VDC or 0 to 20mA control input and provide a 2 to 10VDC or 4 to 20mA operating range. An actuator capable of accepting a pulse width modulating control signal and providing full proportional operation of the damper is acceptable. All actuators shall provide a 2 to 10VDC position feedback signal.
 7. 24 Volts (AC/DC) actuators: All 24VAC/DC actuators shall operate on Class 2 wiring and shall not require more than 10VA for AC or more than 8 watts for DC applications. Actuators operating on 120VAC power shall not require more than 10VA. Actuators operating on 230VAC shall not require more than 11VA.
 8. Non-Spring Return Actuators: All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb torque shall have a manual crank for this purpose.
 9. Modulating Actuators: All modulating actuators shall have an external, built-in switch to allow reversing direction of rotation.
 10. Conduit Fitting & Pre-Wiring: Actuators shall be provided with a conduit fitting and a minimum 3ft electrical cable, and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
 11. U.L. Listing: Actuators shall be Underwriters Laboratories Standard 873 listed and Canadian Standards Association Class 4813 02 certified as meeting correct safety requirements and recognized industry standards.
 12. Warranty: Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque and shall have a 2-year manufacturer's warranty, starting from the date of installation. Manufacturer shall be ISO9001 certified.

PART 4 - DDC SOFTWARE

4.1 OVERVIEW

- A. The system shall continuously perform Direct Digital Control (DDC) functions at the local control module in a stand-alone mode. The operator shall be able to design and modify the control loops to meet the requirements of the system being operated. The operators shall use system provided displays for tuning of PID loops. These displays shall include the past three input variable values, the setpoint for the loop as well as the sample interval and the results of the proportional, integral and derivative effects on the final output.
- B. Minimum Function - Each control module shall perform the following functions:
 - 1. Identify and report alarm conditions
 - 2. Execute all application programs indicated on the I/O Summary table
 - 3. Execute DDC algorithms
 - 4. Trend and store data
- C. Control Failure Mode
 - 1. In the event of a control module failure, all points under its control shall be commanded to the failure mode as indicated on the I/O Summary Table. All DDC software shall reside in the respective control module.
 - a. Orderly Shutdown: Power failures shall cause the control module to go into an orderly shutdown with no loss of program memory.
 - b. Automatic Restart: Upon resumption of power, the control module shall automatically restart and print out the time and date of the power failure and restoration at the respective Workstation system.
 - c. Automatic Restart: The restart program shall automatically restart affected field equipment. The operator shall be able to define an automatic power up time delay for each piece of equipment under control.

PART 5 - APPLICATIONS SOFTWARE

5.1 GENERAL

The following applications software shall be provided for the purpose of optimizing energy consumption while maintaining occupant comfort:

- A. Time of Day Scheduling (TOD) - The system shall be capable of the following scheduling features:
 - 1. Schedule by Type. Scheduling by building, area, zone, groups of zones, individually controlled equipment and groups of individually controlled equipment. Each schedule shall provide beginning and ending dates and times (hours: minutes). A weekly repeating schedule, i.e. between 8:00 a.m. and 5:00 p.m., Monday through Friday shall constitute one schedule, not five.
 - 2. Schedule in Advance. Dated schedules shall be entered up to nine (9) years in advance.
 - 3. Self-Deleting. Schedules shall be self-deleting when effective dates have passed.
 - 4. Leap Year. Leap years shall be adjusted automatically without operator intervention.
- B. Optimum Start/Stop (OSS)/Optimum Enable/Disable (OED)
 - 1. This application provides software to start and stop equipment on a sliding schedule based on the individual zone temperature and the heating/cooling capacity in °F/hour of the equipment serving that zone. The heating/cooling capacity value shall be operator adjustable. Temperature compensated peak demand limiting shall remain in effect during morning start up to avoid setting a demand peak.
- C. Source Temperature Optimization (STO)

1. The system shall automatically perform source optimization for all air handling units, chillers and boilers in response to the needs of other downstream pieces of equipment, by increasing or decreasing supply temperature setpoints, i.e. chilled water, discharge air, etc. using owner defined parameters. In addition to optimization, the STO capability shall also provide for starting and stopping primary mechanical equipment based on zone occupancy and/or zone load conditions.
- D. Demand Limiting (DL) - Temperature Compensated
1. The DL application shall be programmable for a minimum of six separate time of day KW demand billing rate periods. The system shall be capable of measuring electrical usage from multiple meters serving one building and each piece of equipment being controlled on the LAN shall be programmable to respond to the peak demand information from its respective meter.
 - a. Sliding Window: The demand control function shall utilize a sliding window method with the operator being able to establish the kilowatt threshold for a minimum of three adjustable demand levels. The sliding window interval shall be operator selectable in increments of one minute, up to 60 minutes. Systems that incorporate rotating shed tables will not be acceptable.
 - b. Setpoints for Defined Demand Level: The operator shall have the capability to set the individual equipment temperature setpoints for each operator defined demand level. Equipment shall not be shed if these reset setpoints are not satisfied; rather the setpoint shall be revised for the different established demand levels. The system shall have failed meter protection, such that when a KW pulse is not received from the utility within an operator adjustable time period, an alarm will be generated. The system software will automatically default to a predetermined fail-safe shed level.
 - c. Information Archiving: The system shall have the ability to archive demand and usage information for use at a later time. System shall permit the operator access to this information on a current day, month to date and a year to date basis.
- E. Day/Night Setback (DNS)
1. The system shall allow the space temperature to drift down [up] within a preset [adjustable] unoccupied temperature range. The heating [cooling] shall be activated upon reaching either end of the DNS range and shall remain activated until the space temperature returns to the DNS range. (Occupied Set Point should be 73°F Cooling with a Night Setback to 85°F. Occupied Set Point should be 72°F Heating with a Night Setback to 65°F. – This is an initial setting which should be coordinated with the Owner prior to the Owner taking possession of the building.)
- F. Timed Local Override (TLO)
1. The system shall have TLO input points that permit the occupants to request an override of equipment that has been scheduled OFF. The system shall turn the equipment ON upon receiving a request from the local input device. Local input devices shall be push button (momentary contact), wind-up timer, or ON/OFF switches as detailed in the I/O summary.
- G. Space Temperature Control (STC)
1. There shall be two space temperature setpoints, one for cooling and one for heating, separated by a dead band. Only one of the two setpoints shall be operative at any time. The cooling setpoint is operative if the actual space temperature has more recently been equal to or greater than the cooling setpoint. The heating setpoint is operative if the actual space temperature has more recently been equal to or less than the heating setpoint. There are two modes of operation for the setpoints, one for the occupied mode (example: heating = 72°F or 22°C, cooling = 76°F or 24.4°C) and one for the unoccupied mode (example: heating = 55°F or 12.7°C, cooling = 90°F or 32°C).
 - a. Schedule: The occupied/unoccupied modes may be scheduled by time, date, or day of week.
 - b. Color Code: One of seven colors shall be generated to represent the comfort conditions in the space, and shall be displayed graphically at the operator station.

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- 1) If the actual space temperature is in the dead band between the heating setpoint and the cooling setpoint, the color displayed shall be green for the occupied mode, representing ideal comfort conditions. If in the unoccupied mode, the color displayed shall be gray representing 'after-hours' conditions.
 - 2) If the space temperature rises above the cooling setpoint, the color shall change to yellow. Upon further rise beyond the cooling setpoint plus an offset, the color shall change to orange. Upon further rise beyond the cooling setpoint plus the yellow band offset, plus the orange band offset, the color shall change to red indicating unacceptable high temperature conditions. At this point an alarm shall be generated to notify the operator.
 - 3) When space temperature falls below the heating setpoint, the color shall change to light blue. Upon further temperature decrease below the heating setpoint minus an offset, the color shall change to dark blue. Upon further space temperature decrease below the heating setpoint minus the light blue band offset minus the dark blue band offset the color shall change to red indicating unacceptable low temperature conditions. At this point an alarm shall be generated to notify the operator.
- c. Operator Definable: All setpoints and offsets shall be operator definable. When in the occupied mode, start-up mode, or when heating or cooling during the night setback unoccupied mode, a request shall be sent over the network to other equipment in the HVAC chain, such as to an AHU fan that serves the space, to run for ventilation. The operator shall be able to disable this request function if desired.
 - d. Additional Cooling: When comfort conditions are warmer than ideal, indicated by the colors yellow, orange, and high temperature red, a request for additional cooling shall be sent over the network to other cooling equipment in the HVAC chain, such as a chiller. This information is to be used for optimization of equipment in the HVAC chain. The operator shall be able to disable this function if desired.
 - e. Additional Heating: When comfort conditions are cooler than ideal; indicated by the colors light blue, dark blue, and low temperature red; a request for additional heating shall be sent over the network to other heating equipment in the HVAC chain, such as a boiler. This information is to be used for optimization of equipment in the HVAC chain. The operator shall be able to disable this function if desired.
 - f. Cooling/Heating Setpoints: The cooling [and heating] setpoints may be increased [decreased] under demand control conditions to reduce the cooling (heating) load on the building during the demand control period. Up to three levels of demand control strategy shall be provided. The operator may predefine the amount of setpoint increase [decrease] for each of the three levels. Each space temperature sensor in the building may be programmed independently.
 - g. Optimum Start: An optimum start-up program transitions from the unoccupied setpoints to the occupied setpoints. The optimum start-up algorithm considers the rate of space temperature rise for heating and the rate of space temperature fall for cooling under nominal outside temperature conditions; it also considers the outside temperature; and the heat loss and gain coefficients of the space envelope (AI: Space Temperature).
 - h. PID Loop: A PID control loop, comparing the actual space temperature to its setpoint, shall modulate the dampers [and heating coil valve or heating stages in sequence] to achieve the setpoint target.

PART 6 - EXECUTION

6.1 PREPARATION

A. Protection of Persons and Property

1. Safety Precautions and Programs. The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work.

2. Safety of Persons and Property. The Contractor shall take all reasonable precautions and provide all reasonable protection to prevent damage, injury or loss to:
 - a. All employees on the installation sites and all other persons who may be affected.
 - b. All work, materials, and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody, or control of the Contractor or any Subcontractor or Sub-subcontractor.
 - c. Other property at the site or adjacent thereto. The Contractor shall comply with all applicable laws, ordinances, rules, regulations and lawful orders or any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. It shall erect and maintain, as required by existing conditions and progress of the work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.

6.2 HARDWARE INSTALLATION

- A. Utility Company Equipment - Owner shall arrange installation of electric billing meters with demand signal pulses, as indicated on the I/O Summary Table.
- B. Wiring
 1. The Contractor shall install wires for the room temperature sensors (from sensor to the appropriate control module).
 2. The Contractor shall install all sensing devices and the wiring to modules.
 3. The Contractor shall install all control and monitoring wiring in Mechanical Room.
 4. Low voltage wire shall be not less than 18 AWG. All line voltage wire shall be THHN/TFFN, 600 volt rated.
 5. All wire shall be run in conduit (EMT).

6.3 SMOKE DETECTORS

- A. Smoke detectors approved for duct installation shall be provided by Division 16 for all air systems of 2000 cfm capacity or above or as indicated on the drawings, to automatically shut down the supply fan and close all smoke dampers (as required). Each detector shall have an integral relay and be capable of operating a remote. All wiring shall be in conduit.
- B. Smoke detectors shall be furnished by Division 16000 and installed under Division 15000. All wiring between detector and fire alarm system shall be provided and installed under Division 16000. All wiring between detector and unit and between detector and BAS shall be provided and installed under Division 15000. All wiring shall be in conduit.

6.4 FIRE ALARM INTERLOCK, EQUIPMENT INTERLOCK AND EMERGENCY

- A. Provide relays and interlock wiring in the starting circuits of all air moving equipment to stop operation when the building fire alarm system is activated. Contacts shall be installed in the central fire alarm panel for this signal; coordinate with fire alarm panel furnished under Division 16.
- B. Provide on the face of the Central Control Panel and remote alarm panel an "Emergency Stop" switch. Switch shall be wired so that all air moving equipment will immediately shut down when switch is depressed.
- C. Provide all interlock wiring between air-conditioning units, fans, dampers, space sensors, clocks, and other related equipment as necessary to achieve the specified operating sequence.

6.5 RELAYS

- A. Provide relays in power wiring to stop and start exhaust fans, domestic water heaters, pumps, etc., as required. Relays shall be of the voltage and ampere rating required for the load served and shall have NEMA-1 enclosure.

6.6 DAMPER ACTUATORS

- A. Damper actuators shall be 24 volt proportional motor operators. Contacts shall be provided for each actuator, which accepts a 24 volt signal for the smoke detector to close the contact. Step down transformer shall be provided and installed by Div 15 to handle 120 volt power.

6.7 VALVES

- A. Control valves shall be electric operated. Actuators shall be mounted vertically above piping served or horizontally, no lower than the center line of the piping. Surrounding piping and equipment shall be located and valve location in piping shall be such that a minimum service clearance of 6" (or greater as required by the manufacturer's recommendations) is provided between the top of the valve actuator and the obstruction to facilitate maintenance and removal of actuator.

6.8 TELEPHONE LINES

- A. The Owner shall provide a voice grade telephone line.

6.9 DEMAND METERING

- A. An energy pulse signal shall be provided at the building metering point by the utility company. The Contractor shall extend wiring in conduit from the meter location to the control module for demand meter input signal.

6.10 CONTROL PANELS

- A. Furnish formed sheet metal control panels as required with locking door and hinges. All necessary relays, switches and peripheral devices shall be located inside panels. All electric devices shall be connected to numbered terminal strips. All control panels shall be centrally located. The main ALC panel shall be provided with space for a data port. Provide a temporary modem in the main control panel located in the main mechanical room.
- B. Main ALC communication panel shall be located as indicated on the drawings.

6.11 CONTROL WIRING AND CONDUIT

- A. All control wiring shall be run in metal conduit with outlet boxes and fitting equal to those specified under Division 16000. Line voltage wiring shall be no smaller than 14 gauge, 600 volt wire. All conduit shall be located in wall cavity or above ceilings. Wall surface mounted conduit shall be prohibited. Plenum rated cable routed exposed shall be prohibited. Wiring from the main mechanical room ALC panel shall be routed in conduit to the cable tray. All wiring below grade shall be conduit.
- B. Conduit shall be run between the main control panel in the mechanical room and the main communication panel data connection located as indicated on the Drawings..

- C. Conduit shall be provided in the main control panel cabinet between the exterior cabinet and internal main controller.

PART 7 - SEQUENCE OF OPERATION

7.1 Refer to I/O summary for control point description.

7.2 DUCTLESS SPLIT SYSTEMS

- A. Control of fan coil and heat pump units shall be as follows:
 1. A system 20/20 electronic control module shall be provided to monitor the systems and provide on-off programming.
 2. A wall mounted temperature sensor located in the space shall provide an analog input signal to the control module.
 3. Each fan coil unit shall be programmed to start and stop according to the day/night schedule provided by the Owner.
 4. The blower fan shall be energized by a relay and shall run continuously in the day cycle.
 5. On a drop in space temperature below the heating setpoint, the unit controls shall activate the heat cycle.
 6. On a rise in space temperature above the cooling setpoint, the unit controls shall activate the cooling cycle.
 7. The discharge temperatures shall be monitored.

7.3 SPLIT SYSTEM HEAT PUMPS

- A. Control of fan coil and heat pump units shall be as follows:
 1. A system 20/20 electronic control module shall be provided to monitor the systems and provide on-off programming.
 2. A wall mounted temperature sensor located in the space shall provide an analog input signal to the control module.
 3. Each fan coil unit shall be programmed to start and stop according to the day/night schedule provided by the Owner.
 4. The blower fan shall be energized by a relay and shall run continuously in the day cycle.
 5. On a drop in space temperature below the heating setpoint, the unit controls shall activate the heat cycle.
 6. On a rise in space temperature above the cooling setpoint, the unit controls shall activate the cooling cycle.
 7. The discharge temperatures shall be monitored.
 8. Unit economizer section dampers shall be controlled by EMS. Section shall provide free cooling as indicated by differential enthalpy controller. Demand controlled ventilation shall also be provided to maintain maximum carbon dioxide level below 1,000 ppm by adjusting outdoor air damper minimum position.

7.4 SINGLE ZONE PACKAGED UNITS WITH DEHUMIDIFICATION CYCLE

- A. Control module shall be provided for each packaged unit to control the fan, compressor, gas heat, economizer, demand controlled ventilation, and hot gas reheat in the unit.

Start/Stop
Fan Status
Cool 1 / Cool 2

Heat 1 / Heat 2
Hot Gas Reheat Enable / Disable
Outside Air Enable / Disable

- B. A wall mounted temperature sensor located in the space shall provide an analog input signal to the control module. A duct mounted humidity sensor shall be located in the return ductwork, which shall provide an analog input signal to the control module.
- C. Each unit shall be programmed to start and stop according to the day/night schedule provided by the Owner.
- D. The unit fan shall run continuously in the day cycle.
- E. On a rise in space temperature above the cooling set point, the compressor shall start. Provide two stage control for units with two steps of capacity.
- F. On a rise in space humidity above the relative humidity set point and no rise in space temperature above the cooling set point, the compressor(s) shall start and the hot gas heat coil shall be activated. The humidity sensor shall be located in the return ductwork.
- G. On a drop in space temperature below the heating set point, the gas heat shall start.
- H. In the night cycle the unit fan shall be off. On a drop in space temperature below the night setting of 55 degrees F. (adjustable), the fan and the gas heat shall start.
- I. Duct mounted smoke detectors, furnished as part of the fire alarm system and installed in the supply duct of each unit, shall shut down the respective roof-top unit on detection of smoke.
- J. Provide fan status monitoring for the supply fan.
- K. Unit economizer section dampers shall be controlled by EMS. Section shall provide free cooling as indicated by differential enthalpy controller. Demand controlled ventilation shall also be provided to maintain maximum carbon dioxide level below 1,000 ppm by adjusting outdoor air damper minimum position.

7.5 EXHAUST FANS

- A. See fan schedule for type of control for each fan. Fans noted to be controlled through the building energy management system shall be interlocked with control modules, set to operate by a schedule provided by the Owner.

7.6 ELECTRIC CEILING & WALL MOUNTED HEATERS

- A. Units shall be controlled by ALC with a wall mounted temperature sensor and enabled / disabled based on the Owner's occupied/un-occupied schedule.

7.7 EXISTING EQUIPMENT

- A. Existing control devices for HVAC equipment indicated to remain shall remain in use.

7.8 PROJECT START-UP

- A. Controls Contractor shall make out start-up cards for all unit and system controllers, as per start up card furnished below, and shall furnish same before Final Completion of project.
- B. Final submittal of start-up cards shall be bound in a three-ring binder, collated with unit start-up cards by unit number. Start-up cards shall be in ascending order by unit number with the unit start-up card located before the programming start-up card. Different types of equipment (fan-coil units, rooftop units, etc.) shall be separated with clearly labeled tabs.

7.9 SYSTEM ACCEPTANCE

- A. Reference section 01770 for general requirements.

7.10 CLOSEOUT DOCUMENTATION

- A. Properly completed start-up forms, including the form shown below, documenting proper field quality control and demonstration as outlined in section 1.5 above, shall be received by the Owner prior to granting of substantial completion.

CONTROL CONTRACTOR'S PROGRAMMING CHECKLIST
Walker County Schools
ALL INFORMATION IS TO BE TYPED

School Name

Unit No.

EMS Address

Point Editing (w/correct definition (to include unit number and room number), minimum on/off times, alarms limits, heating & cooling limits, etc.)

Critical Alarms

Event Log Setup

Zone Setpoints

Time of Day Schedules

Freeze Protection

Demand Limiting

Duty Cycle

Freezer Equation

Cooler Equation

GRAPHICS:

Remote Point Status Listings

Floor Plan - Location & Label

Equation Flow Charts (if applicable)

END OF SECTION 23 0900

**SECTION 23 1123
FUEL GAS PIPING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

- A. This Section includes fuel gas piping within the building and exterior to the building. Products include the following:
 - 1. Pipe, tube, fittings, and joining materials.
 - 2. Piping specialties.
 - 3. Pressure regulators.
- B. Related Sections include the following:
 - 1. Division 2 Section "Natural Gas Distribution" for additional natural gas service piping, specialties, and accessories outside the building.
 - 2. Section 22 0553 "Identification for Plumbing Piping and Equipment" for piping identification.
 - 3. Section 22 0529 "Hangers and Supports for Plumbing Piping and Equipment" for piping inside the building and rooftop pipe supports.

1.3 PROJECT CONDITIONS

- A. Gas System Pressures: Two pressure ranges. Primary pressure is 2.0 psig, and is reduced to secondary pressure of 0.5 psig or less.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Pressure regulators. Include pressure rating, capacity, and settings of selected models complete with spring color and orifice sizes for each regulator.
- B. Welding certificates.
- C. Operation and Maintenance Data: For natural gas specialties and accessories to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- B. NFPA Standard: Comply with NFPA 54, "National Fuel Gas Code."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify fuel gas supplier. Handle flammable liquids used by Installer with proper precautions and do not leave on premises from end of one day to beginning of next day.

1.7 COORDINATION

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- B. New Equipment: If gas fired equipment purchased is not basis of design equipment, the Contractor shall coordinate differences in gas demand and adjust pipe sizing and capacity requirements for gas pressure regulators based on equipment purchased at no cost increase to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 PIPES, TUBES, FITTINGS, AND JOINING MATERIALS

- A. Domestic Steel Pipe: ASTM A 53/A 53M; Type E or S; Grade B; black. Wall thickness of wrought-steel pipe shall comply with ASME B36.10M.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threaded ends according to ASME B1.20.1.
 - 2. Steel Threaded Fittings: ASME B16.11, forged steel with threaded ends according to ASME B1.20.1.
 - 3. Steel Welding Fittings: ASME B16.9, wrought steel or ASME B16.11, forged steel.
 - 4. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
 - 5. Cast-Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.
 - 6. Joint Compound and Tape: Suitable for natural gas.
 - 7. Steel Flanges and Flanged Fittings: ASME B16.5.
 - 8. Gasket Material: Thickness, material, and type suitable for natural gas.
 - 9. Acceptable Manufacturers:

- a. Pipe:
 - 1) Wheatland
 - 2) Sharon Tube
 - 3) Allied
 - b. Fittings:
 - 1) Ward
 - 2) Anvil
 - 3) Stockham
- B. PE Pipe: ASTM D 2513, SDR 11.
- 1. PE Fittings: ASTM D 2683, socket type or ASTM D 3261, butt type with dimensions matching ASTM D 2513, SDR 11, PE pipe.
 - 2. Transition Fittings: Manufactured pipe fitting with one PE pipe end for heat-fusion connection to PE pipe and with one ASTM A 53/A 53M, Schedule 40, steel pipe end for threaded connection to steel pipe.
 - 3. Service-Line Risers: Manufactured PE pipe fitting with PE pipe inlet for heat-fusion connection to underground PE pipe; PE pipe riser section with protective-coated, anodeless, steel casing and threaded outlet for threaded connection to aboveground steel piping.
 - 4. Components, Tapes, Gaskets, and Bolts and Nuts: Suitable for natural gas and as recommended by piping manufacturer.
 - 5. Acceptable Manufacturers:
 - a. Pipe and fittings:
 - 1) JM Eagle; UAC 2000
 - 2) Duraline; Polytough1
 - 3) Endot Industries; PE-2406/2708

2.4 PIPING SPECIALTIES

- A. Flexible Connectors: ANSI Z21.24, copper alloy.

2.5 PRESSURE REGULATORS

- A. Description: Single stage and suitable for fuel gas service. Include steel jacket and corrosion-resistant components, elevation compensator, and atmospheric vent.
 - 1. Manufacturers:
 - a. Line Pressure Regulators:
 - 1) American Meter Company.
 - 2) Fisher Controls International, Inc.; Division of Emerson.
 - 3) Sensus.
 - 4) Maxitrol Company.
 - 2. NPS 2 and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.
 - 3. NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.
 - 4. Line Pressure Regulators: ANSI Z21.80 with 2.0 psig inlet pressure rating.
- B. Pressure Regulator Vents: Factory- or field-installed, corrosion-resistant screen in opening if not connected to vent piping. Install 90 elbow turned down or pipe full size to exterior where called for on plans. Install insect screen in turn down elbow.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- B. Inspect natural-gas piping according to NFPA 54 and the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.
- C. Comply with NFPA 54 and the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using 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.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.

3.4 INDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in and below building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.

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- H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
 - I. Install piping free of sags and bends.
 - J. Install fittings for changes in direction and branch connections.
 - K. Install escutcheons at penetrations of interior walls, ceilings, and floors.
 - 1. New Piping:
 - a. Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - b. Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type and set screw.
 - L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
 - M. Verify final equipment locations for roughing-in.
 - N. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
 - O. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
 - P. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
 - Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
 - R. Connect branch piping from top or side of horizontal piping.
 - S. Install unions in pipes NPS 2" and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
 - T. Do not use natural-gas piping as grounding electrode.
- 3.5 VALVE INSTALLATION
- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- 3.6 PIPING JOINT CONSTRUCTION
- A. Ream ends of pipes and tubes and remove burrs.
 - B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

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- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
 - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
 - 5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
 - D. Welded Joints:
 - 1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
 - 2. Bevel plain ends of steel pipe.
 - 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
 - E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
 - F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.
 - G. Heat-fusion Weld Joints: Install as per manufacturers' installation instructions.
- 3.7 HANGER AND SUPPORT INSTALLATION
- A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
 - B. Comply with requirements for pipe hangers and supports specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
 - C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1" and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 2. NPS 1-1/4": Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 3. NPS 1-1/2" and NPS 2": Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 4. NPS 2-1/2" to NPS 3-1/2": Maximum span, 10 feet; minimum rod size, 1/2 inch.
- 3.8 CONNECTIONS
- A. Connect to utility's gas main according to utility's procedures and requirements.
 - B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
 - C. Install piping adjacent to appliances to allow service and maintenance of appliances.
 - D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

- A. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for piping identification.
- B. Install tracer wire at gas pipe stub ups accessible and tied off to pipe above grade.

3.10 PAINTING

- A. Comply with requirements in Division 09 painting Sections for painting interior and exterior natural-gas piping.
- B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, and piping specialties, except components, with factory-applied paint or protective coating.
 - 1. Alkyd System: MPI EXT 5.1D.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - c. Topcoat: Exterior alkyd enamel (flat).
 - d. Color: Gray.
- C. Paint exposed, interior metal piping, valves, and piping specialties, except components, with factory-applied paint or protective coating.
 - 1. Latex Over Alkyd Primer System: MPI INT 5.1Q.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (flat).
 - d. Color: Gray.
 - 2. Alkyd System: MPI INT 5.1E.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Interior alkyd matching topcoat.
 - c. Topcoat: Interior alkyd (flat).
 - d. Color: Gray.
- D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Test, inspect, and purge natural gas according to NFPA 54 and the International Fuel Gas Code and authorities having jurisdiction.
- C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.12 DEMONSTRATION

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- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain electronically activated valves.

3.13 OUTDOOR PIPING SCHEDULE

- A. Aboveground natural-gas piping shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
 - 2. Steel pipe with wrought-steel fittings and welded joints.
- B. Underground Piping:
 - 1. PE pipe, PE fittings, and heat-fusion joints.
 - 2. Underground-to-Aboveground Piping Connections: Service-line riser.
 - 3. PE-to-Steel Piping Connections: Transition fitting.

3.14 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

- A. Aboveground, branch piping NPS 1-1/2" and smaller shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
 - 2. Steel pipe with wrought-steel fittings and welded joints.

3.15 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Distribution piping valves for pipe sizes NPS 2" and smaller shall be one of the following as called for on plans:
 - 1. Two-piece, full-port, bronze ball valves with bronze trim.
 - 2. Bronze plug valve.
- B. Distribution piping valves for pipe sizes NPS 2-1/2" and larger shall be the following:
 - 1. Bronze plug valve.
- C. Valves in branch piping for single appliance shall be the following:
 - 1. Two-piece, full-port, bronze ball valves with bronze trim.

3.16 EXAMINATION

- A. Examine roughing-in for gas piping system to verify actual locations of piping connections before equipment installation.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.17 PREPARATION

- A. Close equipment shutoff valves before turning off fuel gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.

3.18 SERVICE ENTRANCE PIPING

- A. Extend fuel gas piping from the meter assembly and connect to fuel gas distribution for service to building.
- B. Install dielectric fitting downstream from and adjacent to each service meter unless meter is supported from service-meter bar with integral dielectric fitting. Install shutoff valve downstream from and adjacent to dielectric fitting. Dielectric fittings are specified in Division 22 Section "Common Work Results for Plumbing."

3.19 PIPING APPLICATIONS

- A. Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated.
- B. Fuel Gas Piping, 5 psig or less:
 - 1. Above ground piping 2-1/2" and smaller: Schedule 40 black steel pipe with malleable-iron threaded fittings.
 - 2. Above ground piping 3" and larger: Schedule 40 black steel pipe with schedule 40 butt weld fittings.
 - 3. Underground Piping: PE pipe, PE fittings, and heat-fusion joints.

3.20 VALVE APPLICATIONS

- A. Appliance Shutoff Valves for Pressure 0.5 to 5 psig: Gas cock or plug cock as called for on plans.
- B. Piping Line Valves, NPS 2 and Smaller: Gas cock or plug cock as called for on plans.
- C. Piping Line Valves, NPS 2-1/2 and Larger: Plug valve.

3.21 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."
 - 1. Above-Ceiling Locations: Gas piping may be installed in accessible spaces, subject to approval of authorities having jurisdiction, whether or not such spaces are used as plenums.
 - 2. In Partitions: Do not install concealed piping in solid partitions. Protect tubing from physical damage when installed inside partitions or hollow walls perpendicular to penetrated walls.
 - a. Exception: Tubing passing through partitions or walls.
 - 3. Prohibited Locations: Do not install gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
 - a. Exception: Accessible above-ceiling space specified above.
- B. Drips and Sediment Traps: Install drips at points where condensate or debris may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.

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1. Construct drips and sediment traps using threaded tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.
- C. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, unless indicated to be exposed to view.
- D. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.
- E. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down. Concentric reducers may be used in vertical and at unit connections.
- F. Connect branch piping from top or side of horizontal piping.
- G. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.
- H. Install strainer on inlet of line pressure regulator to emergency gas generator unit.
- I. Install pressure gauge test port upstream and downstream from each line pressure regulator.
- J. Install flanges on valves, specialties, and equipment having NPS 3 and larger connections.
- K. Install vent piping for gas pressure regulators and gas trains where called for on plans, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screen in large end.
- L. Install identification tag or stencil at each gas pressure regulator to match schedule on Contract Documents.
- M. Install underground, natural gas distribution piping buried at least 30 inches below finished grade.
- N. Install underground, PE, natural gas distribution piping according to ASTM D 2774.
- O. Install continuous # 10 copper tracer wire attached to the crown of buried exterior gas piping with plastic tie straps at maximum 6-foot spacing and within 18 inches of each change of direction. Tracer wire shall extend 6" above finished grade with one complete wrap around pipe.
- P. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tape 12 inches over the top of natural gas distribution piping during backfilling of trenches for piping.
- Q. Exterior steel gas piping and fittings shall be prime painted at the time of installation. Final painting shall be performed after the system is tested for leaks and prior to system to being placed in service.

3.22 JOINT CONSTRUCTION

- A. Basic piping joint construction is specified in Division 22 Section "Common Work Results for Plumbing."
- B. Use materials suitable for fuel gas.
- C. Underground-to-Aboveground Piping Connections: Service-line riser.
- D. PE-to-Steel Piping Connections: Transition fitting.

3.23 HANGER AND SUPPORT INSTALLATION

- A. Pipe hanger and support and equipment support materials and installation requirements are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch".
 - 5. NPS 4 and Larger: Maximum span, 10 feet ; minimum rod size, 5/8 inch

3.24 CONNECTIONS

- A. Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.
- B. Install piping adjacent to appliances to allow service and maintenance.
- C. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72 inches of each appliance. Install union downstream from valve.
- D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.

3.25 PIPING IDENTIFICATION

- A. All gas piping inside the building shall be identified with pipe identification labels as specified in Division 22 Section "Identification for Plumbing Piping and Equipment".
 - 1. Where piping is to be primed and painted, pipe identification shall be applied after the painting is completed.

3.26 PAINTING

- A. Use materials and procedures in Division 9 painting Sections.
- B. Priming of piping and fittings shall be performed at the time of installation. Final painting shall be done after the system has been tested and is free of leaks and prior to being placed in service.

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- C. Paint exterior service meters, pressure regulators, and specialty valves.
 - 1. Color: Gray.

3.27 FIELD QUALITY CONTROL

- A. Test, inspect, and purge piping according to NFPA 54 and requirements of authorities having jurisdiction.
- B. The Architect shall be given 48 hours notice for all scheduled inspections and testing for gas piping system installations.
- C. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.
- D. Verify capacities and pressure ratings of service meters, pressure regulators, valves, and specialties.
- E. Verify correct pressure settings for pressure regulators.
- F. Verify that specified piping tests are complete.

END OF SECTION 23 1123

SECTION 2321 13
HYDRONIC PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:
 - 1. Hot-water heating piping.
 - 2. Makeup-water piping.
 - 3. Condensate-drain piping.
 - 4. Air-vent piping.
 - 5. Condenser Water (Heat Pump) loop piping.
 - 6. Tower Water piping.
- B. Related Sections include the following:
 - 1. Division 15 Section "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

1.03 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:
 - 1. Makeup-Water Piping: 125 psig at 150 deg F.
 - 2. Condensate-Drain Piping: 150 deg F.

1.04 SUBMITTALS

- A. Product Data: For each type of the following: Pressure-seal fittings.
 - 1. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
 - 2. Air control devices.
 - 3. Hydronic specialties.
- B. Shop Drawings: Detail, at 1/4- scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
- C. Welding certificates.
- D. Qualification Data: For Installer.
- E. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installers of Pressure-Sealed Joints: Installers shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
- B. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.01 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
- B. Wrought-Copper Fittings: ASME B16.22.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Anvil International, Inc.
 - b. S. P. Fittings; a division of Star Pipe Products.
 - c. Mueller Brass
- C. Wrought-Copper Unions: ASME B16.22.

2.02 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.
- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.
- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.

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- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in Part 3 "Piping Applications" Article.
- F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- H. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.03 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

2.04 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Hart Industries International, Inc.
 - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - e. Zurn Plumbing Products Group; AquaSpec Commercial Products Division.
 - 2. Factory-fabricated union assembly, for 250-psig minimum working pressure at 180°F.
- D. Dielectric Nipples:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Perfection Corporation; a subsidiary of American Meter Company.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Company, Inc.
 - 2. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.05 VALVES

- A. Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 15 Section "Valves."
- B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Division 15 Section "HVAC Instrumentation and Controls."
- C. Bronze, Calibrated-Orifice, Balancing Valves:
 - 1. Manufacturers: Subject to compliance with requirements:
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump; a division of ITT Industries.
 - c. Flow Design Inc.
 - d. Gerand Engineering Co.
 - e. Griswold Controls.
 - f. Taco
 - g. Victaulic/ IMI-TA
 - h. Nexus
 - 2. Body: Bronze, ball, globe or plug type with calibrated orifice or venturi.
 - 3. Ball: Brass or stainless steel.
 - 4. Plug: Resin.
 - 5. Seat: PTFE or EPDM.
 - 6. End Connections: Threaded or socket.
 - 7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
 - 8. Handle Style: Lever, with memory stop to retain set position.
 - 9. CWP Rating: Minimum 125 psig.
 - 10. Maximum Operating Temperature: 250 deg F.
- D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:
 - 1. Manufacturers: Subject to compliance with requirements,
 - a. Armstrong Pumps, Inc.
 - b. Bell & Gossett Domestic Pump; a division of ITT Industries.
 - c. Flow Design Inc.
 - d. Gerand Engineering Co.
 - e. Griswold Controls.
 - f. Taco.
 - g. Victaulic/ IMI-TA
 - 2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
 - 3. Ball: Brass or stainless steel.
 - 4. Stem Seals: EPDM O-rings.
 - 5. Disc: Glass and carbon-filled PTFE.
 - 6. Seat: PTFE or EPDM.
 - 7. End Connections: Flanged or grooved.
 - 8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
 - 9. Handle Style: Lever, with memory stop to retain set position.
 - 10. CWP Rating: Minimum 125 psig.
 - 11. Maximum Operating Temperature: 250 deg F.
- E. Plug valves (in exterior gas service lines) shall be iron body AGA certified, threaded ends, Class 150 WOG, Rockwell-Nordstrom Series 143, Resun or equal. Gas valves for low pressure service

inside the building shall be shall be U.L. Listed 600 psig WOG rated bronze body large port, chrome plated ball valves, PTFE seat, reinforced packing, equal to Conbraco series 80-100.

F.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS

- A. Makeup-water piping installed aboveground shall be the following:
 - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
- B. Condensate-Drain Piping: Type M, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

3.02 VALVE APPLICATIONS

- A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.
- B. Install calibrated-orifice, balancing valves at each branch connection to return main.
- C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.
- D. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.03 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.

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- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the side the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. All piping shall be adequately supported and guided in accordance with Section 230529.
- Q. All piping specialties shown on drawings or specified herein shall be incorporated into the piping systems and located to provide adequate service clearance.
- R. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- S. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.
- T. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blow-off connection for strainers smaller than NPS 2.
- U. Identify piping as specified in Section 230553.

3.04 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor devices are specified in Section 230553. Comply with the following requirements for maximum spacing of supports.
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
 - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1 or less : Maximum span, 6 feet ; minimum rod size, 3/8 inch .
 - 2. NPS 2 : Maximum span, 8 feet ; minimum rod size, 1/2 inch .
 - 3. NPS 3 & 4 : Maximum span, 8 feet ; minimum rod size, 1/2 inch .

4. NPS 6 : Maximum span, 8 feet ; minimum rod size, 3/4inch .
- D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4 : Maximum span, 5 feet ; minimum rod size, 3/8 inch .
 2. NPS 1 : Maximum span, 6 feet ; minimum rod size, 3/8 inch .
 3. NPS 1-1/2 : Maximum span, 6 feet ; minimum rod size, 3/8 inch .
 4. NPS 2 : Maximum span, 8 feet ; minimum rod size, 3/8 inch .
 5. NPS 2-1/2 : Maximum span, 8 feet ; minimum rod size, 1/2 inch .
 6. NPS 3 : Maximum span, 8 feet ; minimum rod size, 1/2 inch .

3.05 PIPE JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.06 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:

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1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 3. Isolate expansion tanks and determine that hydronic system is full of water.
 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test.
 5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 6. Prepare written report of testing.
- C. Perform the following before operating the system:
1. Open manual valves fully.
 2. Inspect pumps for proper rotation.
 3. Set makeup pressure-reducing valves for required system pressure.
 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
 5. Set temperature controls so all coils are calling for full flow.
 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
 7. Verify lubrication of motors and bearings.

END OF SECTION 23 2113

SECTION 23 2300
REFRIGERANT PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes refrigerant piping used for air-conditioning applications.

1.03 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
 - 1. Suction Lines for Air-Conditioning Applications: 300 psig.
 - 2. Suction Lines for Heat-Pump Applications: 535 psig.
 - 3. Hot-Gas and Liquid Lines: 535 psig.

1.04 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:
 - 1. Thermostatic expansion valves.
 - 2. Solenoid valves.
 - 3. Pressure-regulating valves.
- B. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.06 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.07 COORDINATION

- A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.01 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88, Type L or ASTM B 280, Type ACR.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.

2.02 VALVES AND SPECIALTIES

- A. Check Valves:
 - 1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
 - 2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
 - 3. Piston: Removable polytetrafluoroethylene seat.
 - 4. Closing Spring: Stainless steel.
 - 5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
 - 6. End Connections: Socket, union, threaded, or flanged.
 - 7. Maximum Opening Pressure: 0.50 psig.
 - 8. Working Pressure Rating: 500 psig.
 - 9. Maximum Operating Temperature: 275 deg F.
- B. Service Valves:
 - 1. Body: Forged brass with brass cap including key end to remove core.
 - 2. Core: Removable ball-type check valve with stainless-steel spring.
 - 3. Seat: Polytetrafluoroethylene.
 - 4. End Connections: Copper spring.
 - 5. Working Pressure Rating: 500 psig.
- C. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.
 - 1. Body and Bonnet: Plated steel.
 - 2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 - 3. Seat: Polytetrafluoroethylene.
 - 4. End Connections: Threaded.
 - 5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24, 115, or 208-V ac coil.
 - 6. Working Pressure Rating: 400 psig.
 - 7. Maximum Operating Temperature: 240 deg F.
 - 8. Manual operator.
- D. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
 - 1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
 - 2. Piston, Closing Spring, and Seat Insert: Stainless steel.
 - 3. Seat Disc: Polytetrafluoroethylene.
 - 4. End Connections: Threaded.
 - 5. Working Pressure Rating: 400 psig.
 - 6. Maximum Operating Temperature: 240 deg F.

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- E. Thermostatic Expansion Valves: Comply with ARI 750.
 - 1. Body, Bonnet, and Seal Cap: Forged brass or steel.
 - 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 - 3. Packing and Gaskets: Non-asbestos.
 - 4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
 - 5. Suction Temperature: 40 deg F.
 - 6. Superheat: Adjustable.
 - 7. Reverse-flow option (for heat-pump applications).
 - 8. End Connections: Socket, flare, or threaded union.
 - 9. Working Pressure Rating: 450 psig.

- F. Moisture/Liquid Indicators:
 - 1. Body: Forged brass.
 - 2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
 - 3. Indicator: Color coded to show moisture content in ppm.
 - 4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
 - 5. End Connections: Socket or flare.
 - 6. Working Pressure Rating: 500 psig.
 - 7. Maximum Operating Temperature: 240 deg F.

- G. Mufflers:
 - 1. Body: Welded steel with corrosion-resistant coating.
 - 2. End Connections: Socket or flare.
 - 3. Working Pressure Rating: 500 psig.
 - 4. Maximum Operating Temperature: 275 deg F.

- H. Liquid Accumulators: Comply with ARI 495.
 - 1. Body: Welded steel with corrosion-resistant coating.
 - 2. End Connections: Socket or threaded.
 - 3. Working Pressure Rating: 500 psig.
 - 4. Maximum Operating Temperature: 275 deg F.

2.03 REFRIGERANTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Atofina Chemicals, Inc.
 - 2. DuPont Company; Fluorochemicals Div.
 - 3. Honeywell, Inc.; Genetron Refrigerants.
 - 4. INEOS Fluor Americas LLC.

- B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.01 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

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- B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.
- C. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

3.02 VALVE AND SPECIALTY APPLICATIONS

- A. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.
- B. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- C. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.
- D. Install thermostatic expansion valves as close as possible to distributors on evaporators.
 - 1. Install valve so diaphragm case is warmer than bulb.
 - 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
 - 3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- E. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.
- F. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

3.03 PIPING INSTALLATION

- A. Drawing 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 unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.

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- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operation" for solenoid valve controllers, control wiring, and sequence of operation.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- M. Install refrigerant piping in protective conduit where installed belowground.
- N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- O. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.
- R. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."
- S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.
- U. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.
- V. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

3.04 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

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- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
 - 2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.05 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
 - 2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1/2 : Maximum span, 60 inches ; minimum rod size, 1/4 inch .
 - 2. NPS 5/8 : Maximum span, 60 inches ; minimum rod size, 1/4 inch .
 - 3. NPS 1 : Maximum span, 72 inches ; minimum rod size, 1/4 inch .
 - 4. NPS 1-1/4 : Maximum span, 96 inches ; minimum rod size, 3/8 inch .
 - 5. NPS 1-1/2 : Maximum span, 96 inches ; minimum rod size, 3/8 inch .
 - 6. NPS 2 : Maximum span, 96 inches ; minimum rod size, 3/8 inch .
 - 7. NPS 2-1/2 : Maximum span, 108 inches ; minimum rod size, 3/8 inch .
 - 8. NPS 3 : Maximum span, 10 feet ; minimum rod size, 3/8 inch .
 - 9. NPS 4 : Maximum span, 12 feet ; minimum rod size, 1/2 inch .
- D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 2 : Maximum span, 10 feet ; minimum rod size, 3/8 inch .
 - 2. NPS 2-1/2 : Maximum span, 11 feet ; minimum rod size, 3/8 inch .
 - 3. NPS 3 : Maximum span, 12 feet ; minimum rod size, 3/8 inch .
 - 4. NPS 4 : Maximum span, 14 feet ; minimum rod size, 1/2 inch .
- E. Support multi-floor vertical runs at least at each floor.

3.06 SYSTEM CHARGING

- A. Charge system using the following procedures:
 - 1. Install core in filter dryers after leak test but before evacuation.
 - 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.

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3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.07 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 1. Open shutoff valves in condenser water circuit.
 2. Verify that compressor oil level is correct.
 3. Open compressor suction and discharge valves.
 4. Open refrigerant valves except bypass valves that are used for other purposes.
 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 23 2300

**SECTION 23 3113
METAL DUCTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Single-wall rectangular ducts and fittings.
 - 2. Single-wall round ducts and fittings.
 - 3. Double-wall round ducts and fittings.
 - 4. Sheet metal materials.
 - 5. Duct liner.
 - 6. Sealants and gaskets.
 - 7. Hangers and supports.
 - 8. Exterior ducts and fittings.
- B. Related Sections:
 - 1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
 - 2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

1.4 SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Liners and adhesives.
 - 2. Sealants and gaskets.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 - 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements:
 - a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Spiral Manufacturing Co., Inc.
 - f. Impulse Air
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 DOUBLE-WALL ROUND DUCTS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements:
 - 1. Lindab Inc.
 - 2. McGill AirFlow LLC.
 - 3. SEMCO Incorporated.
 - 4. Sheet Metal Connectors, Inc.
 - 5. Impulse Aire

- B. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.
 - 1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- C. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch- diameter perforations, with overall open area of 23 percent.

- D. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
 - 1. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
 - 2. Coat insulation with antimicrobial coating.
 - 3. Cover insulation with polyester film complying with UL 181, Class 1.

2.4 SHEET METAL MATERIALS

- A. General Material Requirements: Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections. Minimum gauge of sheet metal shall be as specified below:

<u>GREATEST DIMENSION</u>	<u>MIN. U. S. GAUGE</u>
0" - 12"	26
13" - 30"	24
31" - 54"	22
55" - 84"	20
85" and above	18
Plenum	22

Gauges above are minimum thickness of metal and exceed SMACNA standards in many cases.

- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36-inches.

2.5 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
 - 1. Manufacturers: Subject to compliance with requirements:
 - a. CertainTeed Corporation; Insulation Group.
 - b. Johns Manville.
 - c. Knauf Insulation.
 - d. Owens Corning.
 - 2. Performance
 - 1) Building Interior: Type I, Flexible: R-6, 1.5" thick, 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - 2) Building Interior: Type I, Flexible: R-8, 2" thick
 - 3.
 - 4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
- B. Insulation Pins and Washers:
 - 1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- or 0.135-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 - 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."
 - 1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 - 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

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3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
 - a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.6 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 1. Application Method: Brush on.
 2. Solids Content: Minimum 65 percent.
 3. Shore A Hardness: Minimum 20.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. VOC: Maximum 75 g/L (less water).
 7. Maximum Static-Pressure Class: 10-inch wg , positive and negative.
 8. Service: Indoor or outdoor.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
 1. General: Single-component, acid-curing, silicone, elastomeric.
 2. Type: S.
 3. Grade: NS.
 4. Class: 25.
 5. Use: O.
- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

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- E. Round Duct Joint O-Ring Seals:
 - 1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch w.g. and shall be rated for static-pressure class, positive or negative.
 - 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 - 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

2.8 EXTERIOR DUCTS

- A. All exterior exposed ductwork sections shall be connected using a system consisting of minimum 18-gauge galvanized steel with an integral sealant to create an airtight transverse joint. The system shall utilize a neoprene or extruded butyl gasketing between mating flanges the entire length of the joint. The connection system shall be comparable to a S.M.A.C.N.A. class "J" transverse joint. Each transverse joint shall be weatherproofed using a continuous U.L. listed metal cleat applied over the entire joint. The system shall be by Ductmate Industries, Inc., Ward Duct Connector, Inc., or Engineer and Owner approved equal.
- B. All exterior duct shall be constructed to meet SMACNA standards for min. 4" w.c. static pressure. Intermediate section supports shall be angle iron or tie rod type sized per the S.M.A.C.N.A. HVAC Duct Construction Standards - Metal and Flexible - 1995 edition. Reinforcement shall be provided on all sides of duct.
- C. All exterior ductwork joints, reinforcements, and longitudinal seams shall be sealed with Sonneborn "Sonolastic NP-1" urethane sealant. Exterior ductwork shall be sealed, wiped, and cleaned with mineral spirits, and finished with a minimum of two coats of galvanized primer. The color of sealant and primer shall be matched, with color selected by the Owner.

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- D. All exterior ductwork shall be properly sealed to building at penetrations to prevent water entry to building and duct interior.
- E. All exterior ductwork shall be primed and painted with a minimum of 2 coats of architect selected color. Coordinate paint requirements with general division.

2.9 FABRIC DUCT SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide products manufactured in the United States, choose one of the following: Prihoda, Ductsox, Uni-Fab, Fabric-Air, or KE Fibertec.
- B. Air diffusers shall be constructed of a woven fire retardant fabric complying with the following physical characteristics:
 - 1. Fabric Construction: 100% Flame Retardant and treated with a machine wash-able anti-microbial agent from the manufacturer.
 - 2. Weight: 5.2 oz. / sq. yd. per ASTM D3776
 - 3. Color: Standard: Coordinate with Architect
 - 4. Air Permeability: 2 (+2/-1) cfm/ft² per ASTM D737, Frazier
 - 5. Temperature Range: 0 degrees F to 180 degrees F
 - 6. Fire Retardancy: Classified by Underwriters Laboratories in accordance with the flame spread/smoke developed requirements of NFPA 90-A and ICC AC167.
 - 7. Antimicrobial agent shall be proven 99% effective after 10 laundry cycles per AATCC Test Method 100.
- C. System Fabrication Requirements:
 - 1. Air dispersion accomplished by linear vent and permeable fabric. Linear vent is to consist of an array of open orifices rather than a mesh style vent to reduce maintenance requirements of mesh style vents. Linear vents should also be designed to minimize dusting on fabric surface.
 - 2. Size of vent openings and location of linear vents to be specified and approved by manufacturer to provide even air distribution throughout the occupied space. Air distribution system shall provide minimum 10 fpm air flow to within 2' of floor and 2' of exterior wall.
 - 3. Inlet connection to metal duct via fabric draw band with anchor patches as supplied by manufacturer. Anchor patches to be secured to metal duct via zip screw fastener - supplied by contractor.
 - 4. Inlet connection includes zipper for easy removal / maintenance.
 - 5. Lengths to include required zippers as specified by manufacturer.
 - 6. System to include Adjustable Flow Devices to balance turbulence, airflow and distribution as needed. Flow restriction device shall include ability to adjust the airflow resistance from 0.06 - 0.60 in w.g. static pressure.
 - 7. End cap includes zipper for easy maintenance.
 - 8. Fabric system shall include connectors to accommodate suspension system listed below.
 - 9. Fabric duct shall be supported by internal frame system so that duct will maintain inflated shape the entire length of duct run.
- D. Design Parameters:
 - 1. Fabric diffusers shall be designed from 0.25" water gage minimum to 3.0" maximum, with 0.5" as the standard.
 - 2. Fabric air diffusers shall be limited to design temperatures between 0 degrees F and 180 degrees F (-17.8 degrees C and 82 degrees C).

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3. Design CFM, static pressure and diffuser length shall be designed or approved by the manufacturer.
- E. Suspension Hardware: (include applicable components only)
 1. Suspended U-Track: System shall be installed using a tension cable system including a single (1 Row), double (2 Row), or triple (3 row) run of aluminum U-Track. Single (1 Row) located 1-1/2" above top-dead-center. Double (2 Row) located 1-1/2" above the 10 and 2 o'clock locations. Triple (3 Row) located 1-1/2" above 10, 12, and 2 o'clock locations. 2 Row supports are required for systems of 32" diameter and larger. Hardware to include 8' sections of track, splice connectors, track endcaps, and vertical cable support kits - consisting of a length of cable with a locking stud end and Gripple quick cable connectors. Radius aluminum track must be included for all horizontal/flat radius sections.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Ductwork, unless noted otherwise, shall be constructed for a positive pressure of 2" W.C. for supply ductwork and a negative pressure of 1.5" W.C. for exhaust and return ductwork. Ductwork reinforcement shall be provided as required by the SMACNA HVAC Duct Construction Standards - Metal & Flexible - Third Edition - 2005 for the pressure class and minimum gauges listed above. **Contractor shall submit a schedule indicating duct gauge and reinforcement methods to be utilized for each duct dimension range outlined above prior to fabricating any ductwork. Minimum metal thickness is listed in Para 2.4A above.** Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

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- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."
- M. Sizes of duct indicated as lined shall be adjusted to accommodate liner thickness maintaining interior dimensions.

3.2 SEAM AND JOINT SEALING

- A. Seal Classes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements."
 - 1. For static-pressure classes 2 inch wg, comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Seal Class C:

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

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- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.6 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as follows:
 - 1. Dishwasher Hood Exhaust Ducts:
 - a. Type 304, stainless-steel sheet.
 - b. Exposed to View: No. 4 finish.
 - c. Concealed: No. 2D finish.
 - d. Welded seams and flanged joints with watertight EPDM gaskets.
- B. Intermediate Reinforcement:
 - 1. Galvanized-Steel Ducts: Galvanized steel.
 - 2. Stainless-Steel Ducts: Galvanized steel.
- C. Liner:
 - 1. Supply- and Return-Air Ducts: Fibrous glass, Type I, 1 inch thick.
 - 2. Transfer Ducts: Fibrous glass, Type I, 1 inch thick.
- D. Double-Wall Duct Interstitial Insulation:
 - 1. Supply- and Return-Air Ducts, 16 Inches and Smaller in Diameter or Rectangular Equivalent: 1 inch thick.
 - 2. Supply- and Return-Air Ducts, 18 Inches and Larger in Diameter or Rectangular Equivalent: 1 inch thick.
- E. Elbow Configuration:
 - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

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- 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.
- F. Branch Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 23 3113

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Backdraft and pressure relief dampers.
 - 2. Barometric relief dampers.
 - 3. Manual volume dampers.
 - 4. Control dampers.
 - 5. Fire dampers.
 - 6. Ceiling dampers.
 - 7. Smoke dampers.
 - 8. Combination fire and smoke dampers.
 - 9. Turning vanes.
 - 10. Duct-mounted access doors.
 - 11. Flexible connectors.
 - 12. Flexible ducts.
 - 13. Spin-ins.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.
- B. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.04 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.01 MATERIALS

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

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- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and exposed ducts.
- D. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- E. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.02 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements:
 - 1. Air Balance Inc.; a division of Mestek, Inc.
 - 2. American Warming and Ventilating; a division of Mestek, Inc.
 - 3. Cesco Products; a division of Mestek, Inc.
 - 4. Duro Dyne Inc.
 - 5. Greenheck Fan Corporation.
 - 6. Lloyd Industries, Inc.
 - 7. Nailor Industries Inc.
 - 8. NCA Manufacturing, Inc.
 - 9. Pottorff; a division of PCI Industries, Inc.
 - 10. Ruskin Company.
 - 11. SEMCO Incorporated.
 - 12. Vent Products Company, Inc.
- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 2000 fpm.
- D. Maximum System Pressure: 2-inch wg.
- E. Frame: 0.052-inch- thick, galvanized sheet steel, with welded corners and mounting flange.
- F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch width, 0.025-inch- thick, roll-formed aluminum noncombustible, tear-resistant, neoprene-coated fiberglass with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Neoprene, mechanically locked.
- I. Blade Axles:
 - 1. Material: Galvanized steel.

2. Diameter: 0.20 inch.

J. Tie Bars and Brackets: Aluminum or Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball or synthetic pivot bushings.

M. Sleeve: Minimum 20-gage thickness.

2.03 BAROMETRIC RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements:

1. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Duro Dyne Inc.
5. Greenheck Fan Corporation.
6. Lloyd Industries, Inc.
7. Nailor Industries Inc.
8. NCA Manufacturing, Inc.
9. Pottorff; a division of PCI Industries, Inc.
10. Ruskin Company.
11. SEMCO Incorporated.
12. Vent Products Company, Inc.

B. Suitable for horizontal or vertical mounting.

C. Maximum Air Velocity: 2000 fpm.

D. Maximum System Pressure: 2-inch wg.

E. Frame: 0.064-inch- thick, galvanized sheet steel, with welded corners and mounting flange.

F. Blades:

1. Multiple, 0.025-inch- thick, roll-formed aluminum.
2. Maximum Width: 6 inches.
3. Action: Parallel.
4. Balance: Gravity.
5. Eccentrically pivoted.

G. Blade Seals: Neoprene.

H. Blade Axles: Galvanized steel.

I. Tie Bars and Brackets:

1. Material: Aluminum or Galvanized steel.
2. Rattle free with 90-degree stop.

J. Return Spring: Adjustable tension.

K. Bearings: Synthetic.

- L. Accessories:
 - 1. Adjustment device to permit setting for varying differential static pressures.

2.04 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.
 - c. Flexmaster U.S.A., Inc.
 - d. McGill AirFlow LLC.
 - e. METALAIRE, Inc.
 - f. Nailor Industries Inc.
 - g. Pottorff; a division of PCI Industries, Inc.
 - h. Ruskin Company.
 - i. Trox USA Inc.
 - j. Vent Products Company, Inc.
 - 2. Standard leakage rating, with linkage outside airstream.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:
 - a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
 - 6. Blade Axles: Galvanized steel.
 - 7. Bearings:
 - a. Oil-impregnated bronze or Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 - 8. Tie Bars and Brackets: Galvanized steel.
- B. Jackshaft:
 - 1. Size: 1-inch diameter.
 - 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 - 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- C. Damper Hardware:
 - 1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
 - 2. Include center hole to suit damper operating-rod size.
 - 3. Include elevated platform for insulated duct mounting.
- D. Spin-in fittings:

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1. Spin-in fittings shall be used for round take-offs from rectangular duct mains. Spin-ins shall include a scoop extractor and balancing damper with 2" stand-off bracket with locking quadrant and continuous square shaft with end bearings. See plan details.
- E. Use of "Dove-Tail" fittings or connections is prohibited.

2.05 CONTROL DAMPERS

- A. Manufacturers: Subject to compliance with requirements:
1. American Warming and Ventilating; a division of Mestek, Inc.
 2. Arrow United Industries; a division of Mestek, Inc.
 3. Cesco Products; a division of Mestek, Inc.
 4. Duro Dyne Inc.
 5. Flexmaster U.S.A., Inc.
 6. Greenheck Fan Corporation.
 7. Lloyd Industries, Inc.
 8. M&I Air Systems Engineering; Division of M&I Heat Transfer Products Ltd.
 9. McGill AirFlow LLC.
 10. METALAIRE, Inc.
 11. Metal Form Manufacturing, Inc.
 12. Nailor Industries Inc.
 13. NCA Manufacturing, Inc.
 14. Ruskin Company.
 15. Vent Products Company, Inc.
 16. Young Regulator Company.
- B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
- C. Frames:
1. Hat shaped.
 2. Galvanized-steel channels, 0.064 inch thick.
 3. Mitered and welded corners.
- D. Blades:
1. Multiple blade with maximum blade width of 8 inches.
 2. Parallel- and opposed-blade design.
 3. Galvanized steel.
 4. 0.064 inch thick.
 5. Blade Edging: Closed-cell neoprene edging.
 6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.
- E. Blade Axles: 1/2-inch- diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
1. Operating Temperature Range: From minus 40 to plus 200 deg F.
- F. Bearings:
1. Oil-impregnated bronze or Molded synthetic.
 2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 3. Thrust bearings at each end of every blade.

2.06 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements,:
 - 1. Air Balance Inc.; a division of Mestek, Inc.
 - 2. Arrow United Industries; a division of Mestek, Inc.
 - 3. Cesco Products; a division of Mestek, Inc.
 - 4. Greenheck Fan Corporation.
 - 5. McGill AirFlow LLC.
 - 6. METALAIRE, Inc.
 - 7. Nailor Industries Inc.
 - 8. NCA Manufacturing, Inc.
 - 9. PHL, Inc.
 - 10. Pottorff; a division of PCI Industries, Inc.
 - 11. Prefco; Perfect Air Control, Inc.
 - 12. Ruskin Company.
 - 13. Vent Products Company, Inc.
 - 14. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.
- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 4000-fpm velocity.
- D. Fire Rating: 1-1/2 and 3 hours.
- E. Frame: Curtain type with blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.
- F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 - 1. Minimum Thickness: 0.052 or 0.138 inch thick, as indicated, and of length to suit application.
 - 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- G. Mounting Orientation: Vertical or horizontal as indicated.
- H. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.
- I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.07 CEILING DAMPERS

- A. Manufacturers: Subject to compliance with requirements:
 - 1. Air Balance Inc.; a division of Mestek, Inc.
 - 2. Cesco Products; a division of Mestek, Inc.
 - 3. McGill AirFlow LLC.
 - 4. METALAIRE, Inc.
 - 5. Nailor Industries Inc.

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6. Prefco; Perfect Air Control, Inc.
 7. Ruskin Company.
 8. Vent Products Company, Inc.
 9. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. General Requirements:
1. Labeled according to UL 555C by an NRTL.
 2. Comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."
- C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.
- D. Blades: Galvanized sheet steel with refractory insulation.
- E. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.
- F. Fire Rating: 2 hours.

2.08 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements,:
1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. METALAIRE, Inc.
 4. SEMCO Incorporated.
 5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."
- D. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.
- E.

2.09 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements,:
1. American Warming and Ventilating; a division of Mestek, Inc.
 2. Cesco Products; a division of Mestek, Inc.
 3. Ductmate Industries, Inc.
 4. Flexmaster U.S.A., Inc.
 5. Greenheck Fan Corporation.
 6. McGill AirFlow LLC.
 7. Nailor Industries Inc.
 8. Pottorff; a division of PCI Industries, Inc.
 9. Ventfabrics, Inc.

10. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."
 1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
 - c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.
 - d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.010 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements:
 1. Ductmate Industries, Inc.
 2. Flame Gard, Inc.
 3. 3M.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness 0.0428-inch stainless steel.
- D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.
- F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.011 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements:
 1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. Ventfabrics, Inc.
 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.

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- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd.
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.
- F. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
 - 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 - 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 - 7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.012 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Flexmaster U.S.A., Inc.
 - 2. McGill AirFlow LLC.
 - 3. Thermaflex
 - 4. Atco
- B. Insulated, Flexible Duct: UL 181, Class 1, CPE film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
 - 1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 20 to plus 175 deg F.
- C. Flexible Duct Connectors:
 - 1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action for sizes 3 through 18 inches, to suit duct size. **Nylon cable straps are not acceptable for securing flexible duct.**

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

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- B. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Install fire and smoke dampers according to UL listing.
- G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils.
 - 2. Downstream from manual volume dampers, control dampers, turning vanes, and equipment.
 - 3. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 4. At each change in direction and at maximum 50-foot spacing.
 - 5. Upstream of turning vanes.
 - 6. Elsewhere as indicated.
- H. Install access doors with swing against duct static pressure.
- I. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
- J. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- K. Install flexible connectors to connect ducts to equipment.
- L. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- M. Connect variable volume and powered induction terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.
- N. Connect diffusers or light troffer boots to low-pressure ducts directly or with maximum 72" lengths of flexible duct. Flexible ducts shall be supported at 36" intervals. Supports shall be attached to the structure and shall not crimp or impede proper airflow through the installed ductwork.
- O. Connect flexible ducts to metal ducts with stainless steel draw bands.

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- P. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

END OF SECTION 233300

SECTION 23 3423
HVAC POWER VENTILATORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Centrifugal roof ventilators.

1.03 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on 1,000-foot elevation.
- B. Operating Limits: Classify according to AMCA 99.

1.04 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
 - 1. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound-power ratings.
 - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 4. Material thickness and finishes, including color charts.
 - 5. Dampers, including housings, linkages, and operators.
 - 6. Roof curbs.
 - 7. Fan speed controllers.
- B. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.05 QUALITY ASSURANCE

- A. 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.
- B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
- C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- D. UL Standard: Power ventilators shall comply with UL 705.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.
- B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.

1.07 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.08 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. Belts: One set(s) for each belt-driven unit.

PART 2 - PRODUCTS

2.01 CENTRIFUGAL ROOF VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Acme Engineering & Mfg. Corp.
 - 2. Aerovent; a Twin City Fan Company
 - 3. Greenheck.
 - 4. Loren Cook Company.
 - 5. Penn Ventilation.
- B. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- C. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.
 - 1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains and grease collector.
 - 2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.
- D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- E. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

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2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
 3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
- F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base. Refer to Division 07 for additional requirements.
1. Configuration: Self-flashing without a cant strip, with mounting flange.
 2. Overall Height: 16 inches or greater per roofing bond requirements.
- 2.02 MOTORS
- A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - B. Enclosure Type: Totally enclosed, fan cooled.
- 2.03 SOURCE QUALITY CONTROL
- A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
 - B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Section "Roof Accessories" for installation of roof curbs.
- C. Install units with clearances for service and maintenance.
- D. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.02 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.

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- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.03 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

END OF SECTION 23 3423

SECTION 23 3713
DIFFUSERS, REGISTER, AND GRILLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Rectangular and square ceiling diffusers.
 - 2. Louver face diffusers.
 - 3. Adjustable bar registers and grilles.
 - 4. Fixed face registers and grilles.
- B. Related Sections:
 - 1. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 - 1. Revise subparagraphs below to suit Project.
 - 2. Ceiling suspension assembly members.
 - 3. Method of attaching hangers to building structure.
 - 4. Size and location of initial access modules for acoustical tile.
 - 5. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 6. Duct access panels.
- C. Source quality-control reports.
- D. The reflected ceiling plan shall be referenced to determine air device frame types. Air devices located in gypsum board ceilings shall be installed with steel surface mount adaptor frame.

PART 2 - PRODUCTS

2.01 CEILING DIFFUSERS

- A. Rectangular and Square Ceiling Diffusers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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- a. Krueger.
 - b. METALAIRE, Inc.
 - c. Nailor Industries Inc.
 - d. Price Industries.
 - e. Titus.
 2. Devices shall be specifically designed for variable-air-volume flows.
 3. Material: Steel or Aluminum.
 4. Finish: Baked enamel, white.
 5. Face Size: Per schedule and ceiling type.
 6. Mounting: Per schedule and ceiling type.
 7. Pattern: Fixed.
 8. Dampers: Radial opposed blade.
 9. Accessories:
 - a. Equalizing grid.
 - b. Plaster ring.
 - c. Safety chain.
 - d. Wire guard.
 - e. Sectorizing baffles.
 - f. Operating rod extension.
- B. Louver Face Diffuser:
1. See Editing Instruction No.1 in the Evaluations for cautions about naming manufacturers. Retain one of first two subparagraphs and list of manufacturers below. See Division 01 Section "Product Requirements."
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. METALAIRE, Inc.
 - c. Nailor Industries Inc.
 - d. Price Industries.
 - e. Titus.
 3. Devices shall be specifically designed for variable-air-volume flows.
 4. Material: Steel or Aluminum.
 5. Finish: Baked enamel, white.
 6. Face Size: Per schedule and ceiling type.
 7. Mounting: Per schedule and ceiling type.
 8. Pattern: Four-way, unless noted otherwise.
 9. Dampers: Radial opposed blade.
 10. Accessories:
 - a. Square to round neck adaptor.
 - b. Adjustable pattern vanes.
 - c. Throw reducing vanes.
 - d. Equalizing grid.
 - e. Plaster ring.
 - f. Safety chain.
 - g. Wire guard.
 - h. Sectorizing baffles.
 - i. Operating rod extension.

2.02 REGISTERS AND GRILLES

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- A. Adjustable Bar Register:
1. See Editing Instruction No.1 in the Evaluations for cautions about naming manufacturers. Retain one of first two subparagraphs and list of manufacturers below. See Division 01 Section "Product Requirements."
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. METALAIRE, Inc.
 - c. Nailor Industries Inc.
 - d. Price Industries.
 - e. Titus.
 3. Material: Steel or Aluminum.
 4. Finish: Baked enamel, white.
 5. Face Blade Arrangement: Vertical spaced 3/4 inch apart.
 6. Core Construction: Integral.
 7. Rear-Blade Arrangement: Horizontal spaced 3/4 inch apart.
 8. Frame: 1-1/4 inches wide.
 9. Mounting Frame: Per schedule and ceiling type.
 10. Mounting: Per schedule and ceiling type.
 11. Damper Type: Adjustable opposed blade.
- B. Adjustable Bar Grille:
1. See Editing Instruction No.1 in the Evaluations for cautions about naming manufacturers. Retain one of first two subparagraphs and list of manufacturers below. See Division 01 Section "Product Requirements."
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. METALAIRE, Inc.
 - c. Nailor Industries Inc.
 - d. Price Industries.
 - e. Titus.
 3. Material: Steel or Aluminum.
 4. Finish: Baked enamel, white.
 5. Face Blade Arrangement: Vertical spaced 3/4 inch apart.
 6. Core Construction: Integral.
 7. Rear-Blade Arrangement: Horizontal spaced 3/4 inch apart.
 8. Frame: 1-1/4 inches wide.
 9. Mounting Frame: Per schedule and ceiling type.
 10. Mounting: Per schedule and ceiling type.
- C. Fixed Face Register:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. Nailor Industries Inc.
 - c. Price Industries.
 - d. Titus.
 2. Material: Steel or Aluminum.
 3. Finish: Baked enamel, white.
 4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.

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5. Core Construction: Integral.
 6. Frame: 1-1/4 inches wide.
 7. Mounting Frame: Per schedule and ceiling type.
 8. Mounting: Per schedule and ceiling type.
 9. Damper Type: Adjustable opposed blade.
- D. Fixed Face Grille:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. Nailor Industries Inc.
 - c. Price Industries.
 - d. Titus.
 2. Material: Steel or Aluminum.
 3. Finish: Baked enamel, white.
 4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
 5. Core Construction: Integral.
 6. Frame: 1-1/4 inches wide.
 7. Mounting Frame: Per schedule and ceiling type.
 8. Mounting: Per schedule and ceiling type.

2.03 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- 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 practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

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3.03 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 3713

SECTION 23 4100
PARTICULATE AIR FILTRATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes factory-fabricated air-filter devices and media used to remove particulate matter from air for HVAC applications.
- B. Owner retains a filter changing service. Contractor is responsible for permanent filter racks under this contract.

1.3 SUBMITTALS

- A. Product Data: Include dimensions; operating characteristics; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each model indicated.
- B. Operation and Maintenance Data: For each type of filter and rack to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of air filters and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- B. Comply with ARI 850.
- C. Comply with ASHRAE 52.1 and ASHRAE 52.2 for method of testing and rating air-filter units.
- D. Comply with NFPA 90A and NFPA 90B.

1.5 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.

1.6 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. Provide one complete set of filters for each filter bank. If system includes pre-filters, provide only pre-filters.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 - 1. AAF International.
 - 2. Filtration Group.
 - 3. Airguard Industries, Inc.
 - 4. Research Products Corp.

2.2 REPLACEABLE MEDIA PANEL FILTERS

- A. Description: Factory-fabricated, replaceable media filters with holding frames.
- B. Media: Fibrous material with anti-microbial agent and held in place by self-supporting wire grid of the frame below. Minimum rating MERV-8. Media shall be pleated to provide a maximum media face velocity of 300 FPM with a maximum clean pressure drop of 0.15" w.g.
- C. Media-Grid Frame: Steel frames with hardware cloth grid in accordance with Owner's filter service standards.
- D. Duct-Mounting Frames: Welded, galvanized steel with gaskets and fasteners, and suitable for bolting together into built-up filter banks.

2.3 SIDE-SERVICE HOUSINGS

- A. Description: Factory-assembled, side-service housings, constructed of galvanized steel, with flanges to connect to duct system.
- B. Access Doors: Continuous gaskets on perimeter and positive-locking devices. Arrange so filter cartridges can be loaded from either access door.
- C. Sealing: Incorporate positive-sealing gasket material on channels to seal top and bottom of filter cartridge frames to prevent bypass of unfiltered air.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install filter frames according to manufacturer's written instructions.
- B. Position each filter unit with clearance for normal service and maintenance. Anchor filter holding frames to substrate.
- C. Install filters in position to prevent passage of unfiltered air.
- D. Coordinate filter installations with duct and air-handling unit installations.
- E. Install ionic air cleaners in accordance with the manufacturers written instructions and as detailed on the Drawings.

3.2 CLEANING

- A. After completing system installation and testing, adjusting, and balancing air-handling and air-distribution systems, clean filter housings and install new filter media.

END OF SECTION 23 4100

SECTION 234300
BI-POLAR IONIZATION UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

- A. This section describes the design, performance and installation of an air purification system intended for use as part of another manufacturer's air handling unit, including, but not limited to fan-coils and other air handling equipment as shown on the plans, details or equipment schedules.

1.3 RELATED WORK

- A. Testing, balancing and inspection services
- B. Facility Access and Protection
- C. Duct work
- D. Electrical Wiring
- E. Control Wiring

1.4 SUBMITTALS

- A. Product Data: Include dimensions; operating characteristics; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each model indicated.
- B. The following information shall be submitted to the design professional prior to the release of any equipment for fabrication.
- C. Product performance data for filters, gauges and housings.
- D. Product drawings detailing all physical, electrical, duct work and control requirements.
- E. Manufacturer's Follow-up Service Program.

1.5 REFERENCE TO CODES AND STANDARDS

- A. ASHRAE Standards 62 & 52
- B. UL Standard 867
- C. CFR 39-75 Title 21 April 17, 1974

- D. National Electric Code NFPA 70, 1990

1.6 QUALITY ASSURANCE

- A. The Air Purification System shall be a product of an established manufacturer with installations in successful operation for a minimum of 10 years with the USA. Technologies that do not address gas disassociation such as UV Lights, Powered Particulate Filters and/or polarized media filters shall not be considered.
- 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. The complete Air Purification System including the Bi-polar ionization unit and Remote Monitor as assembled, complete with power and control wiring, safety switches, airflow switches and controls shall be listed by either UL or ETL.
- D. Provide Indoor Air Quality calculations using the formulas within ASHRAE Standard 62.2- 2004 to validate acceptable indoor air quality at the quantity of outside air scheduled. Demonstrate design experience and proficiency in at least 10 related projects completed over a minimum period of ten years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
 - 1. Bi-polar Ionization:(Basis of Design: Global Plasma Solutions. Equals are, as follows below, provided they meet all requirements of this specification. Requests for prior approval shall be submitted within two weeks of the bid date and include a minimum of 5 similar application references with owner contact name and phone number. The contractor shall be responsible for any costs associated by substitution. All other alternate manufacturers submitted for substitution must provide their ASHRAE 62.1-2004 calculations that prove conformance to the ASHRAE Standard 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 and an independent validation study has been performed to validate the accuracy of the ASHRAE modeling software.
 - a. BioClimatic Air Systems
 - b. BioOxygen.
 - c. Plasma Air
 - d. Atmos Air

2.2 DESCRIPTION

- A. Each piece of air handling equipment, and other equipment so designated on the plans, details and/or equipment schedules shall contain a Bi-polar Ionization system capable of:
 - 1. Effectively killing microorganisms throughout cooling coil, drain pan and supply duct (mold, bacteria, virus, etc.).
 - 2. Controlling gas phase contaminants generated from human occupants, building structure and furnishings.
 - 3. Capable of reducing static space charges.

4. The operation of the bi-polar ionization shall be through a combination of Association / Disassociation processes.
- B. The bi-polar ionization system shall operate in such a manner so that agglomeration or precipitation of airborne particulate shall not be permitted to collect on occupants, walls, floor or furnishings by virtue of its operation. Systems that agglomerate particulate shall not be permitted. A minimum MERV 8 pre-filter shall be provided in the air handling equipment to conform to ASHRAE Standard 62.1-2004 Section 6.2.1.1.
- C. Air Exchange Rate
 1. Air exchange rates may vary through the full operating range of a constant volume or VAV system. The quantity of air exchange shall not be increased due to requirements of the air purification system.
- D. Velocity Profile
 1. The air velocity through the plenum approaching the air purification system shall not exceed 1,000 fpm (5 m/s) in the Bi-polar Ionization Section.
- E. Humidity
 1. Ion generators shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 99% shall not cause damage, deterioration or dangerous conditions within the air purification system.

2.3 EQUIPMENT REQUIREMENTS

- A. A schematic representation of the air purification system is indicated on the drawings and/or shown on the details, plans or equipment schedules.
- B. Electrode Specifications (Bi-polar Ionization)
 1. Each Bi-polar Ionization unit shall include the required number of electrodes and power generators sized to the air handling equipment capacity. Electrodes shall be installed in pairs and include insulators to create the required dielectric. The dielectric shall consist of suitable inorganic non-corrosive insulation material so that the presence of water vapor, gasses or airborne particles will not affect the dielectric value. Electrodes of ferrous or copper composition with or without plating are not acceptable due to corrosion. Each electrode shall have a minimum operating life of 32,000 hours.
 2. Electrical power to the electrodes shall be interrupted when the airflow is less than 100 fpm or when access doors to the electrode plenum section are opened.
- C. PIU mounted devices
 1. PIU devices shall be individual duct mounted Ionization Filtration unit(s). The generator shall be installed in the center of the air stream with the external generator in a convenient location above the ceiling or within the unit for visual indication of power, removal and servicing. Filtration on any equipment requiring Bi-polar Ionization shall be MERV 8 or better. Duct mounted units shall be one of several types as scheduled:
 - a. Regulated Unit generators shall have an ionization status indication lights, fuse with fuse holder, external alarm connector and test jack on the bottom or side; visible on the exterior of the duct. The units will be supplied with a permanent base that is mounted to the duct for ease in removal and replacement of the ion generator for servicing. The permanent base will incorporate an electrical outlet with junction box for power.
 - b. Unregulated Ion generators shall have a power indicator light, fuse with fuse holder. The units will be supplied with a permanent base that is mounted to the duct for ease in removal and replacement of the ion generator for servicing.
 - c. Each plenum mounted and unregulated Ion generator shall have a power indicator light, fuse with fuse holder, external alarm connector and test jack on the bottom or side. Individual units are designed to be wholly mounted in parallel internal to the

duct or plenum. The units will be supplied on a slide out or other serviceable removable device. Units are typically pre-mounted and wired within a plenum section with Remote Monitor(s), air pressure switches and all ancillary devices mounted; if shipped loose field interconnecting wiring, wiring back to the remote monitor and all safeties shall be performed in the field by the installing contractor.

- d. Self Contained Ion generators shall have a power indicator light; reset able circuit breaker and internal self contained air pressure switch with internal and external pressure ports. The units will be supplied with a permanent base that is mounted to the duct for ease in removal and replacement of the ion generator for servicing. The permanent base will incorporate an electrical outlet with junction box for power.

2.4 IONIZATION REQUIREMENTS

A. Bi-Polar Ionization Generator(s)

1. Bi-polar ionization generator(s), capable of controlling gas phase contaminants, shall be provided for all equipment listed in paragraph 2.1.
2. The Bi-polar ionization system shall consist of ionization pinpoints, power generators, remote monitor and power regulator, safety door switches, airflow switches, and other accessories required for safe and efficient operation. The Bi-polar system shall be installed where indicated on the plans
3. The self-contained generators, located at each unit, shall be designed so that the electrodes must be disconnected prior to removal of the unit.

- B. The operation of the electrodes or Bi-polar ionization units shall conform to ASHRAE Standard 62.1 and CFR 39-75 with respect to ozone generation.

2.5 ELECTRICAL REQUIREMENTS

- A. Power for ionization unit shall be provided from transformer of unit served. Coordinate with HVAC unit manufacturer that unit transformer is appropriately sized for addition of ionization unit.

2.6 CONTROL REQUIREMENTS

- A. Where unregulated Ion Generators are installed (such as roof curb, return plenums or duct installations), a remote monitor shall be provided to provide generator voltage regulation and sense and enunciate voltage, current and electrical / electronic features. Visual alarms on the Remote Monitor shall be included to indicate power generator high voltage electrode status and faults prior to unit failure. High voltage output shall not vary more than 2% for a 10% variation in line voltage. Note: Remote monitors for all roof curb applications are supplied and installed as part of the assembled roof curb unit. Remote monitors for duct installations shall be located in locations agreed to by the engineer to accommodate routine visual inspection. At no time will remote monitors be powered when the Air Handling equipment is not operating. Power wiring from the single point power connection point shown on the electrical drawings through the air pressure switch and/or Air Handling fan relay will be the responsibility of the Division 15 contractor if not shown otherwise on the Division 16 drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The duct mounted units shall be installed in accordance with the manufacturer's instructions by the mechanical contractor. The electrical contractor shall complete single point power connections to the integral unit Ion Generator.
- B. All equipment shall be assembled and installed in a workman like manner to the satisfaction of the owner, architect, and consulting engineer.
- C. Any material damaged by handling, water or moisture shall be replaced, by the mechanical contractor, at no cost to the owner.
- D. All equipment shall be protected from dust and damage on a daily basis throughout construction.
- E. Clean all components prior to commissioning.
- F. Install electrodes when commissioning air purification system.

3.2 TESTING

- A. Provide the manufacturers recommended electrical and static pressure tests.

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.
- B. Provide 5 copies of Operating and Maintenance Manuals.
- C. Warranty and Service
 - 1. A manufacturer's authorized service representative shall provide service support to insure satisfactory air purification system operation. The service program shall include at minimum, factory startup and commissioning, bi-annual site visits for a period of four years, inspection of the air purification system and air handling equipment, monitoring and validation, inspection of protected areas, replacement of bad tubes and generator, and the submission of a written report to the owner and consulting engineer of record. This service shall include the replacement of all the tubes at the end of the fourth year (labor and tubes). The service contract shall begin when substantial completion has been granted.
 - 2. Submit the Manufacturer's Service Program if requesting prior approval.

3.4 CLEANING

- A. After completing system installation and testing, adjusting, and balancing air-handling and air-distribution systems and at accepted substantial completion, clean filter housings and install new filter media.

END OF SECTION 15860

**SECTION 23 5543
WALL & CEILING HEATERS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes wall and ceiling heaters with propeller fans and electric heating elements.

1.03 SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Plans, elevations, sections, and details.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
- C. Operation and Maintenance Data: For wall and ceiling heaters to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE

- A. 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.

PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Raywall.
 - 2. Markel Products.
 - 3. Q-Mark Electric Heating.

2.02 ELECTRIC CEILING MOUNTED HEATERS

- A. Provide heavy duty, ceiling mounted, forced air heater of the voltage as specified under the electrical division of work. Units shall be installed and wired in accordance with the manufacturer's recommendations and applicable national and local codes.
- B. Heater shall be lay-in ceiling design mounted in the horizontal position. Unit shall contain vertical down discharge designed to supply heated air at the floor with unit mounted at 10'-0" above floor.

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- C. Fan motor shall be permanently lubricated, totally enclosed, shaded pole type with impedance protection. A protective shield shall surround the motor to separate return air from the supply air.
- D. Heating element assemblies shall consist of two or three corrosion resistant steel sheathed elements, mechanically bonded to common corrosion resistant steel fins. Elements shall be helically coiled nickel chromium alloy resistance wire completely embedded in and surrounded by magnesium oxide, enclosed and swaged into corrosion resistant steel sheaths. Elements shall have no more than 60 watts per inch.
- E. Heaters shall be equipped with a zero-voltage reset thermal overload, which disconnects the motor and elements should normal operating temperatures be exceeded. Provide with manual reset.
- F. Provide wall mounted, heavy duty, tamper proof, low voltage thermostat.
- G. Units shall be U.L. listed with integral disconnect switch.

2.03 ELECTRIC WALL HEATERS

- A. Provide heavy duty, wall mounted, forced air heater of the voltage as specified under the electrical division of work. Units shall be installed and wired in accordance with the manufacturer's recommendations and applicable national and local codes.
- B. Heater shall be wall mounted in the vertical. Unit shall contain vertical down discharge designed to supply heated air at the floor.
- C. Fan motor shall be permanently lubricated, totally enclosed, shaded pole type with impedance protection. A protective shield shall surround the motor to separate return air from the supply air.
- D. Heating element assemblies shall consist of two or three corrosion resistant steel sheathed elements, mechanically bonded to common corrosion resistant steel fins. Elements shall be helically coiled nickel chromium alloy resistance wire completely embedded in and surrounded by magnesium oxide, enclosed and swaged into corrosion resistant steel sheaths. Elements shall have no more than 60 watts per inch.
- E. Heaters shall be equipped with a zero-voltage reset thermal overload, which disconnects the motor and elements should normal operating temperatures be exceeded. Provide with manual reset.
- F. Provide with integral, tamper proof, low voltage thermostat.
- G. Units shall be U.L. listed with integral disconnect switch, and be manufactured by Markel, Raywall, or Berko.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive wall and ceiling heaters for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in for electrical connections to verify actual locations before wall and ceiling heater installation.

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- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install wall boxes in finished wall assembly.
- B. Install wall and ceiling heaters to comply with NFPA 90A.
- C. Suspend wall and ceiling heaters from structure with threaded rod.

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 ADJUSTING

- A. Adjust initial temperature set points.

END OF SECTION 23 5543

SECTION 23 8126
DUCTLESS SPLIT-SYSTEM HEAT PUMP UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes split-system heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.03 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Shop Drawings: Diagram power, signal, and control wiring.
 - 1. Remaining paragraphs are defined in Division 01 Section "Submittal Procedures" as "Informational Submittals."
- C. Operation and Maintenance Data: For split-system heat pump units to include in emergency, operation, and maintenance manuals.
- D. Warranty: Special warranty specified in this Section.

1.04 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."
- 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.
 - 1. LEED-NC Prerequisite EQ 1 requires compliance with requirements in ASHRAE 62.1-2004, including requirements for controls, surfaces in contact with the airstream, particulate and gaseous filtration, humidification and dehumidification, drain pan construction and connection, finned-tube coil selection and cleaning, and equipment access. Verify, with manufacturers, availability of units with components and features that comply with these requirements.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

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1. LEED-NC Prerequisite EA 2 requires minimum efficiency equal to requirements in ASHRAE/IESNA 90.1-2004.
 - D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Heat pump."
- 1.05 COORDINATION
- A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete."
- 1.06 WARRANTY
- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system heat pump units that fail in materials or workmanship within specified warranty period.
 1. Compressors shall be warranted for five years.
 2. Warranty Period: Remainder of unit one year from date of Substantial Completion and additional four years for compressor.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Carrier Air Conditioning; Div. of Carrier Corporation.
 2. Mitsubishi Electronics America, Inc.; HVAC Division.
 3. Trane
 4. Daikin

2.02 EVAPORATOR-FAN COMPONENTS

- A. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
 1. Retain subparagraphs below to comply with LEED-NC Prerequisite EQ 1.
 2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
 3. Drain Pan and Drain Connection: Comply with ASHRAE 62.1-2004.
- B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.
- C. Fan: Direct drive, centrifugal fan.
- D. Unit shall be wall or ceiling mounted ductless type fan-coil as scheduled with integral discharge deflection grilles, wall mounted controls, and easy to remove filters. Units shall be U.L. listed.

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- E. Interior of cabinet shall be insulated with ¼-inch thickness fiberglass insulation. Cabinet shall include a condensate drain pan with anti-corrosion coating; die formed intake grille, permanent filter, and bi-directional discharge grille with auto-sweep feature.
 - 1. Motor characteristics such as NEMA designation, temperature rating, service factor, enclosure type, and efficiency are specified in Division 23 Section "Common Motor Requirements for HVAC Equipment." If different characteristics are required, add paragraphs below to suit Project.
- F. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - 1. Special Motor Features: Multi-tapped, multi-speed with internal thermal protection and permanent lubrication.

2.03 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

- A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
- B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - 1. Compressor Type: Reciprocating.
- C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid sub-cooler.
 - 1. Retain first paragraph below for heat pump units.
- D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.
- E. Fan: Aluminum-propeller type, directly connected to motor.
- F. Motor: Permanently lubricated, with integral thermal-overload protection.
- G. Low Ambient Kit: Permits operation down to 45 deg F.
- H. Mounting Base: Polyethylene.
- I. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1-2004, "Energy Standard for Buildings except Low-Rise Residential Buildings."

2.04 ACCESSORIES

- A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.
- B. Automatic-reset timer to prevent rapid cycling of compressor.
- C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- D. Manufacturer's recommended condensate pump kit

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install ground-mounting, compressor-condenser components on 4-inch- thick, reinforced concrete base; 6 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.
- D. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch. Refer to Division 23 0548 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- E. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to unit to allow service and maintenance.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.03 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.04 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 8126

SECTION 23 8127
SPLIT SYSTEM AIR CONDITIONER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.3 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.
- C. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."
- 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. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2010, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- D. ASHRAE/IESNA 90.1-2007 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2007, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.5 COORDINATION

- A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete."

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Compressor - Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Carrier
 - 2. Trane
 - 3. Lennox
 - 4. Daikin

2.2 FAN-COIL UNITS

- A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
 - 1. Insulation: Faced, glass-fiber duct liner.
 - 2. Drain Pans: Galvanized steel, with connection for drain; insulated and complying with ASHRAE 62.1-2010.
 - 3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2010.
- B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.
- C. Heating Coil: Electric resistance coil having a U.L. listed certification, and complete with all operating and safety controls.
- D. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
- E. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - 1. Special Motor Features: Multi-tapped, multispeed with internal thermal protection and permanent lubrication.
- F. Disposable Filters: 1 inch thick, in fiberboard frames with ASHRAE 52.2 MERV rating of 6 or higher.
- G. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

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- A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
 - B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - 1. Compressor Type: Reciprocating or Scroll.
 - C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.
 - D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.
 - E. Fan: Aluminum-propeller type, directly connected to motor.
 - F. Motor: Permanently lubricated, with integral thermal-overload protection.
 - G. Low Ambient Kit: Permits operation down to 45 deg F.
 - H. Mounting Base: Polyethylene.
 - I. Refrigerant: R-134a
 - J. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1-2004, "Energy Standard for Buildings except Low-Rise Residential Buildings."
- 2.4 ACCESSORIES
- A. Control equipment and sequence of operation are specified in Division 23 Section "HVAC Controls"
 - B. Automatic-reset timer to prevent rapid cycling of compressor.
 - C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install ground-mounting, compressor-condenser components on 4-inch- thick, reinforced concrete base; 4 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

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- D. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch. Refer to Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
- E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.
- F. Units shall interface with Building Controls via BACnet.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to unit to allow service and maintenance.
- C. Duct Connections: Duct installation requirements are specified in Division 23 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 23 Section "Air Duct Accessories."
- D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- E. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 23 8127

**SECTION 23 8130
PACKAGED UNITS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Division 23 Section "HVAC Instrumentation and Controls" for control wiring and control devices connected to energy recovery units.

1.02 SUMMARY

- A. This Section includes the following rooftop air conditioners:
 - 1. Cooling and heating units 6 tons and smaller.
 - 2. Cooling and heating units 7-1/2 to 25 tons.

1.03 DEFINITIONS

- A. BAS: Building automation system

1.04 SUBMITTALS

- A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection. Prepare the following by or under the supervision of a qualified professional engineer:
 - 1. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
 - 2. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.
 - 3. Wiring Diagrams: Power, signal, and control wiring.
- C. Operation and Maintenance Data: For rooftop air conditioners to include in emergency, operation, and maintenance manuals.
- D. Warranties: Special warranties specified in this Section.

1.05 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of rooftop air conditioners and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

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- 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. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."
- D. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- E. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- F. Comply with NFPA 54 for gas-fired furnace section.
- G. ARI Certification: Units shall be ARI certified and listed.
- H. ARI Compliance for Units with Capacities Less Than 135,000 Btuh : Rate rooftop air-conditioner capacity according to ARI 210/240, "Unitary Air-Conditioning and Air-Source Heat Pump Equipment."
 - 1. Sound Power Level Ratings: Comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."
- I. ARI Compliance for Units with Capacities 135,000 Btuh and More: Rate rooftop air-conditioner capacity according to ARI 340/360, "Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment."
 - 1. Sound Power Level Ratings: Comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."

1.06 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. These items are specified in Division 7 Section "Roof Accessories."
- C. Coordinate size, location, and installation of rooftop air-conditioner manufacturer's roof curbs and equipment supports with roof installer.
- D. Coordinate installation of restrained vibration isolation roof-curb rails.
- E. Duct mounted smoked shall be installed to be accessible from a 8 foot ladder except for in the Gymnasium and Cafeteria.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of rooftop air conditioners that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Final Completion.

2. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than five years from date of Final Completion.
3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three years from date of Final Completion.
4. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Final Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.02 SELF-CONTAINED PACKAGED AIR CONDITIONERS

- A. Manufacturers:
1. Carrier
 2. Daikin
 3. Lennox
 4. Trane
- B. Furnish and install factory assembled, piped and wired single package air conditioners of the type, size operational characteristics and capacity as shown and scheduled on the plans and as specified herein. Unit shall have gas heating section. **All units 3 tons and larger shall be equipped with a 100% modulating outside air economizer cycle.**
- C. Casings:
1. Unit shall be designed specifically for outdoor installation. All components including accessories shall be contained within the unit.
 2. Unit shall be insulated with a minimum of one inch, one pound density glass fiber insulation.
- D. Compressor:
1. Hermetic or semi-hermetic reciprocating compressors shall be provided with capacity reduction of a minimum of two steps.
 2. A crankcase heater shall be provided and wired to be active continuously.
 3. The compressors shall be provided with vibration isolators.
 4. Self-reversing oil pump shall provide positive lubrication regardless of rotation.
 5. Compressor shall receive a run-in test at the factory prior to installation into the rooftop units.
 6. Each compressor shall have a warranty covering parts failure for a period of five years.
- E. Refrigerant circuit:
1. Coils shall be constructed of copper tubes mechanically bonded to aluminum fins. It shall be tested for leaks at 300 psig pressure prior to installation within the unit. Expansion valve and filter drier shall be factory installed.
 2. The evaporator coil shall consist of separate refrigerant circuits with individual thermal expansion valves. Provide liquid line sight glasses and filter dryers. Each circuit shall have separate refrigerant controls.
 3. Refrigeration controls shall include a minimum high and low pressure control, compressor winding thermostat and overload, lockout circuit resettable at the unit thermostat, contactors for condenser/evaporator fans and compressor, and control power transformer.

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4. Condenser fans shall be direct driven propeller type using three phase motors.
- F. Heating Section: This section shall include a tubular natural gas fired heat exchanger made of aluminized steel. The design shall be AGA certified specifically for outdoor applications downstream from refrigerant cooling coils. The heat exchanger shall include AGA certified burner and gas train controls using direct spark ignition.
- G. Evaporator Fan: Evaporator fan shall be belt driven forward curved type with an adjustable sheave and motor sized to meet the air flow and static pressure as scheduled on the drawings. Motor shall have thermal overload protection and motor and fan bearings shall be permanently lubricated.
- H. Filters: Two sets of 2", 35% efficient, pleated throwaway filters shall be provided with the units.
- I. Refrigerant shall be R-410a, R-134a.
- J. Accessories to be provided:
 1. Factory furnished and wired firestats. Return air firestats shall be set at 135 degrees and supply air firestats at 245 degrees wired so as to shut down the supply air fan if a fire exists. Firestats shall be of the manual reset type.
 2. Low ambient operation kit (25 degrees F).
 3. Fully automatic economizer cycle for units 3 tons and larger including factory installed controls with moisture eliminators and minimum position rheostat including dampers with modulating controllers and spring return operators. Provide barometric relief including exhaust dampers and exhaust hood.
 4. All rooftop units shall be furnished with an internal factory mounted 120 Volt convenience outlet, internally wired through the roof curb assembly. Outlet shall be powered separately from the rooftop unit to allow continued operation when the unit disconnect is off.
 5. Units shall contain an integral de-humidification cycle with hot gas reheat coil as indicated in equipment schedule.
 6. Unit shall be provided with dehumidification cycle, which consist of hot gas reheat coil. All associated wiring, tubing, and valves shall be provided and factory installed. Unless noted otherwise all units shall be furnished with a dehumidification cycle.
 7. All units shall be provided with "soft-start" capability to ramp up the supply fan speed slowly. Provide units with soft start motor or variable speed drive to accomplish this.
 8. BACnet interface to communicate with the Building Controls System.

2.03 ROOF MOUNTING CURBS

- A. Provide a pre-fabricated, insulated, 12-gauge galvanized steel roof mounting curb for all roof mounted and concrete pad mounted equipment. Duct support members shall be provided to allow for pre-hanging of ductwork prior to unit installation. Provide gasketing to form a positive, weather tight seal between the curb and unit base. Design shall comply with all requirements of the National Roofing Contractors Association. Base of curb shall conform to roof slope and provide a level base on which to mount equipment. Curb overall height (from roof structure to top of curb) shall provide a min. 12" clearance between the top of the curb and the finished roof surface or the minimum height required to meet the roofing bond specifications, whichever is greater.
- B. Insulation shall be 1-1/2-inch-thick, 3-lb. density rigid type. Nailer shall be constructed of pressure treated wood.

- C. All roof mounting curbs shall comply with requirements of architectural Division 07 the specifications. All roof curbs shall be approved by the Architect prior to placing order for construction.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install units level and plumb, maintaining manufacturer's recommended clearances.
- B. Curb Support: Install and secure rooftop air conditioners on curbs and coordinate roof penetrations and flashing with roof construction. Secure units to curb support with anchor bolts.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Controls shall be interfaced and connected per 23 0900 HVAC Instrumentation and Controls. Unit shall interface with "Reliable Controls" provided controls.
- C. Install piping adjacent to machine to allow service and maintenance.
 - 1. Gas Piping: Comply with applicable requirements in Division 23 Section "Fuel Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.
- D. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
 - 1. Install ducts to termination in roof curb.
 - 2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
 - 3. Connect supply ducts to rooftop unit with flexible duct connectors specified in Division 23 Section "Duct Accessories."
 - 4. Terminate return-air duct through roof structure and insulate space between roof and bottom of unit with 2-inch- thick, acoustic duct liner.
- E. Electrical System Connections: Comply with applicable requirements in Division 26 Sections for power wiring, switches, and motor controls.
- F. Ground equipment according to Division 26 Section "Grounding and Bonding."
- G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.03 STARTUP SERVICE

- A. Engage a factory-employed service representative to perform startup service.
- B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
 - 1. Inspect for visible damage to unit casing.

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2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to compressor, air-cooled outside coil, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean outside coil and inspect for construction debris.
10. Clean furnace flue and inspect for construction debris.
11. Connect and purge gas line.
12. Adjust vibration isolators.
13. Inspect operation of barometric dampers.
14. Lubricate bearings on fan.
15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
16. Adjust fan belts to proper alignment and tension.
17. Start unit according to manufacturer's written instructions.
18. Start refrigeration system in summer only.
19. Complete startup sheets and attach copy with Contractor's startup report.
20. Inspect and record performance of interlocks and protective devices; verify sequences.
21. Operate unit for an initial period as recommended or required by manufacturer.
22. Inspect outside-air dampers for proper stroke and interlock with return-air dampers.
23. Start refrigeration system and measure and record the following:
24. Coil leaving-air, dry- and wet-bulb temperatures.
25. Coil entering-air, dry- and wet-bulb temperatures.
26. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
27. After startup and performance testing, change filters, vacuum heat exchanger and cooling and outside coils, lubricate bearings, adjust belt tension, and inspect operation of power vents.

3.04 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- C. Occupancy Adjustments: When requested within 12 months of date of Final Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose, without additional cost.

3.05 FIELD QUALITY CONTROL

- A. During construction unit filters shall be periodically changed while the unit is in operation. This shall include unit filter as well as a filter media to be placed over the return grilles. The unit filter and filter media shall be dated at each replacement. If the ductwork or evaporator coil becomes dirty, the contractor shall clean the ductwork and coil. The contractor shall provide the owner a letter stating that all coils have been inspected and are clean at Substantial Completion.

3.06 DEMONSTRATION

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- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged air conditioners. Refer to Division 1 Section "Demonstration and Training".

3.07 CLOSEOUT DOCUMENTATION

- A. Properly completed start-up forms, including equipment marks and serial numbers, documenting proper start-up service, adjusting, and demonstration shall be received by the Owner prior to granting of substantial completion.

END OF SECTION 23 8103

SECTION 26 0000

GENERAL

1.01 CONTRACT DOCUMENTS:

- A. All work of Section 26 0000 shall comply with the requirements of:
 - 1. General Conditions
 - 2. Supplementary General Conditions
 - 3. General Requirements
 - 4. Specifications
 - 5. Drawings
 - 6. Modifications incorporated in the documents before their execution.

1.02 WORK INCLUDED

- A. This Division of the specifications (26 0000) 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.

1.03 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.
- 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.

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- 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.

1.04 SHOP DRAWINGS/ SUBMITTALS

- A. General: The contractor shall provide a minimum of eight complete sets of submittal data for review. Submittal data shall be assembled in complete sets, by trade, in hard back three ring binders. Each submittal book shall include a numbered index sheet. All submittal data for one trade shall be submitted at one time unless unavailable information would delay job progress. Each manufacturer's submittal sheet shall clearly indicate the model number, size, electrical characteristics, style, color, accessories, system, operation descriptions, etc. being submitted.
 - 1. Equipment Power Supply and Wiring Requirements: The contractor shall submit for review a tabulated sheet of equipment power supply and wiring requirements for all mechanical equipment requiring power as specified in Division 15 of these specifications. Requirements shall be identified by horsepower or KW, operating amperage, required voltage and phase requirements, and manufacturer's suggested overcurrent circuit protection device size and minimum circuit ampacity size. Where the electrical requirements submitted for mechanical equipment differs from the branch circuitry shown on the electrical drawings, (when using the basis of design unit listed in the mechanical schedules/specifications or a similar unit of the same size from listed alternate manufacturers), the contractor shall make the necessary adjustments to the branch circuitry per the 2014 NEC at no additional cost to the owner. When changes are made to power requirements for equipment due to Owner/Architect/Engineer approved value engineering changes to equipment, this cost must be included in the value engineering overall change order cost. Costs due to adjustments in branch circuitry to equipment due to value engineering changes will not be allowed after the overall value engineering change order has been approved. In all cases, power and wiring requirements for mechanical equipment must be provided to the engineer before or at the same time as the shop drawings for the electrical distribution gear. In no case shall electrical distribution gear be ordered or branch circuitry roughed in prior to engineer review and comment on this document. Any equipment ordered or branch circuitry roughed in on the jobsite without this review and comment will be totally at the contractor's risk. The Tabulation sheet submitted shall be in the following format:

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- B. Identification of Submittal Books: Each submittal book shall indicate the Project Name and address, Architect and address, Engineer and address, Electrical Contractor and address, and any Sub-contractors and addresses.
- C. Review: The contractor shall review all submittal prior to submitting to ensure compliance with the contract documents. Comments made by the Architect do not relieve the contractor from complying with the contact documents (Drawings, Specifications, and Addenda). The purpose of the submittals is to demonstrate to the Architect that the contractor understands the design concept and that he demonstrates his understanding by indicating which equipment and materials he intends to furnish and install. When Shop Drawings are reviewed, some errors may be detected but others may be overlooked. This does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings, the requirements of the Drawings and Specifications shall be followed and are not waived or superseded in any way by the Shop Drawing review. Any deviations from the contract documents shall be clearly stated on the submittal data. If not clearly stated the submittal shall be marked "Revised and Resubmit". Failure of the contractor to provide submittals during the submittal process shall make the contractor totally responsible for any

an
d
EXAMPLE:

UNIT	MANUFACTURER	CONTRACT DOCUMENTS				CONFIRM	MECHANICAL SUBMITTAL		
		BKR	VOLT	PH	PANEL	MATCH	VOLTAGE	PH	MOC P
WHP-1	BARD S31H1	20/3	480	3	H2-2	<input type="checkbox"/>			
WHP-2	BARD S31H1	20/3	480	3	H2-8	<input type="checkbox"/>			
WHP-3	BARD S31H1	20/3	480	3	H2-14	<input type="checkbox"/>			
WHP-4	BARD S31H1	20/3	480	3	H2-20	<input type="checkbox"/>			

nges to achieve compliance with the contract documents. Items on the submittal stamp are described as follows:

1. No Exceptions: Submittal reviewed and appears to be in compliance with the contract documents. Furnish as submitted.
2. No Exceptions As Corrected: Submittal reviewed and appears to be in compliance with the contract documents except for items noted. Contractor shall insure noted corrections are incorporated into the equipment furnish to the project. No resubmittal required unless requested.
3. Revise and Resubmit: Submittal reviewed does not comply with the contract documents. Contractor shall resubmit equipment to the Architect with additional information indicating compliance with the contract documents.

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4. Not Acceptable: Submittal for incorrect job or submittal damaged during shipment or delivery
- D. Submit information as required under SUBMITTALS, for each of the individual electrical sections of the specifications.
- E. Items to be submitted:
 1. Equipment Power Supply and Wiring Requirements
 2. Panelboards
 3. Fuses
 4. Conduit and Raceway
 5. Conductors and Cable
 6. Outlets and Boxes
 7. Wiring Devices
 8. Disconnect Switches
 9. Grounding Equipment and Materials
 10. Labeling Materials and Equipment
 11. Firestopping Materials
- F. Data submitted shall contain all information required to indicate compliance with equipment specified. Submit field information drawings to explain fully all procedures involved in erecting, mounting and connecting all items of equipment which differ from that specified.

1.05 RECORD DRAWINGS:

- A. One complete set of electrical drawings shall be reserved for as-built drawings. Any approved deviation from the contract drawings shall be recorded on these drawings. Drawings shall be checked monthly for completeness.
- B. Completed as-built drawings shall be presented to the Architect prior to final inspection.

1.06 MAINTENANCE AND OPERATING INSTRUCTIONS:

- A. Provide at the time of final inspection three sets of maintenance and operating instruction for:
 1. Lighting and Power Panelboards
 2. Fuses
 3. Wiring Devices
 4. Lighting Fixtures and Lamps
 5. Disconnect Switches
- B. Furnish a qualified and accredited factory trained technician to train personnel designated by the Owner in the proper operation and maintenance of specialized equipment.
- C. The issuing of operating instructions shall include the submission of the name, address, and telephone number of the manufacturer's representative and service company for each item of equipment so that service and spare parts can be readily obtained.

1.07 CODES AND PERMITS:

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- 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) - 2014 Edition
 - 2. The National Electrical Safety Code (ANSI C-2)
 - 3. The Life Safety Code (NFPA 101)
 - 4. The International Building Code
 - 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.

1.08 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 judgement, 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.

1.09 COOPERATION:

- 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 ceiling lighting fixtures, both recessed and surface mounted, 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.

1.10 INSTALLATION:

- A. Raceways, fixtures, devices, and other electrical equipment shall be installed in a neat and workmanlike manner and in accordance with recognized good practice for a first class installation.
- B. The Architect or his representative shall have the authority to reject any workmanship not complying with the contract documents.

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- C. The Electrical Contractor shall personally or through an authorized licensed and competent electrician, constantly supervise the work from beginning to complete and final inspection.
- D. Electrical equipment shall be installed in accordance with manufacturer's recommendations.
- E. 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.
- F. Consult owner and utility companies for underground lines before any underground work is started. Contractors shall be responsible for any damage.

1.11

EXCAVATION, TRENCHING AND BACKFILLING:

- A. General. The Contractor shall perform all excavation to install conduit structures and equipment specified in this Division of the Specifications. During excavation, materials for backfilling shall be piled back from the banks of the trench to avoid over-loading and to prevent slides and cave-ins. All excavated materials not to be used for backfill shall be removed and disposed of by the Contractor. Grading shall be done to prevent surface water from flowing into trenches and other excavations and water accumulating therein shall be removed by pumping. All excavations shall be made by open cut. No tunneling shall be done. All requirements of OSHA shall be complied with.
- B. Trench Excavation. The bottom of the trenches shall be graded to provide uniform bearing and support for each section of the conduit on undisturbed soil at every point along its entire length. Over depths shall be backfilled with loose, granular, moist earth, tamped. Removed unstable soil that is not capable of supporting the conduit and replace with specified material.
- C. Backfilling. The trenches shall not be backfilled until it is reviewed by the Architect or his representative. The trenches shall be backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, and gravel or soft shale, free from large clods of earth or stones, deposited in 6" layers and tamped until the conduit has a cover of not less than the adjacent existing ground but not greater than 2" above existing ground. The backfilling shall be carried on simultaneously on both sides of the trench so that conduit is not displaced. The compaction of the filled trench shall be at least equal to that of the surrounding undisturbed material, except that trenches occurring under paved areas or in areas to be filled shall be backfilled in 6" maximum layers and each layer compacted to 95% maximum density. Settling the backfill with water will not be permitted. Any trenches not meeting compaction requirements or where settlement occurs shall have backfill removed down to the top of the conduit then backfill with approved materials as specified hereinbefore.
- D. Positively no tree roots are to be damaged, hand dig where required. Hand digging means no shovels or picks. Damaged trees or shrubbery shall be replaced in kind and must be approved by Engineer.

1.12

MATERIALS:

- A. Materials specified by manufacturer's name shall be used unless approval of other manufacturers are listed in addenda to these specifications.

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- 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.

1.13

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. Electrical circuits to equipment furnished under other sections of these specifications are based on design loads. If actual equipment furnished has loads other than design loads electrical circuits and protective devices shall be revised to be compatible with equipment furnished at no additional cost to the Owner. Any revisions must have prior approval by the Architect. Before submitting shop drawings, Electrical Sub-Contractor shall along with the Mechanical Sub-Contractor review voltage and load requirements for mechanical and plumbing equipment to determine the compatibility between what is being furnished and what is shown in the contract drawings. The Electrical Sub-Contractor shall along with his submittals submit a statement that he has reviewed all shop drawings including review with the Mechanical and Plumbing Sub-Contractors.
- E. 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.

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- F. 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.
- G. 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.
- H. 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 thereunder. 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 15 of these specifications. Control conductors for mechanical equipment shall not be installed in same conduit with power conductors.

1.14

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.

1.15

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

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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 16, paint backboards with two coats of light grey semi-gloss paint.

1.16

GUARANTEE:

- A. All systems and component parts shall be guaranteed for one year 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.

END OF SECTION 26 0000

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SECTION 26 0100

PANELBOARDS

PART 1. GENERAL

1.01 WORK INCLUDED

- A. Distribution, lighting and receptacle power panelboards.

1.02 SUBMITTALS

- A. Submit product data and complete shop drawings consisting of the following:
1. Manufacturer's published literature on the panelboards including individual component information and information on the complete, assembled unit.
 2. Layout of electrical equipment in electrical rooms providing National Electrical Code required clearances.
 3. Bus short-circuit withstandability (RMS symmetrical amperes fault current rating) and withstandability of lowest rated device.
 4. Overall dimensions of panelboard and switchboards including space available for conduits and conductors.

PART 2. PRODUCTS

2.01 PANELBOARDS

- A. Manufacturers: Acceptable manufacturers are Square D, General Electric, Cutler-Hammer, or Siemens.
- B. Panelboards shall be dead-front type, circuit breaker type panelboards. Panelboards shall be factory assembled equipped with thermal magnetic molded case circuit breakers with frame and trip ratings as shown or noted on plan.
- C. Circuit Breakers: Quick-make, quick-break, thermal magnetic molded case, trip indicating, and have internal common trip on all multi-pole circuit breakers. Circuit breakers shall be toggle operating, ambient compensated, and have bolted bus connections. All circuit breakers used at 120/208V shall have minimum interrupting capacity of not less than 10,000 A.I.C. symmetrical. (277/480 V - 14,000 AIC minimum). See drawings for AIC ratings.
- D. Bus Arrangement: Connections to branch circuit breakers shall be distributed phase sequence type. Three-phase, four-wire bussing shall be arranged so that any three adjacent single-pole circuit breakers are individually connected to each of the three different phases in such a manner that two or three-pole circuit breakers may be installed in any location. All bus assembly and other

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current-carrying parts shall be copper. Main circuit breakers shall have ratings as shown or noted on drawings. Provide grounding bus in all panelboards with lugs sized to accept all ground conductors required.

- E. Boxes: Boxes shall not have concentric knockouts pre-punched by the manufacturer. Boxes shall be general purpose, NEMA 1, minimum 20 inches wide by 5-3/4 inches deep. Boxes shall be constructed of galvanized National Electrical Code gauge steel. Side and end wire gutters shall be 4 inches minimum or as required by the National Electrical Code.
- F. Panelboard Front Covers: Front covers shall be standard type. Front covers shall be flush or surface type as shown or noted, constructed of National Electrical Code gauge steel and painted with a rust inhibitive primer and factory finished with manufacturer's standard light gray enamel. Interior trim shall have adjustable clamps and shall be complete with no open sections over circuit breaker spaces on flush mounted panelboards. Trim clamps and hinges shall be concealed. A steel frame for the panelboard circuit breaker index (directory) shall be provided inside door.

PART 3. EXECUTION

3.01 PANELBOARD INSTALLATION

- A. Furnish and install factory assembled panelboards as specified herein and as shown on the drawings.
- B. Install panelboards with top of panelboards 6 feet A.F.F. unless otherwise noted or required to avoid conflicts with other equipment. For panelboards with box dimensions too tall for this arrangement, mount the panelboard so that the operating handle of the uppermost circuit breaker or switch does not exceed 6 feet A.F.F. However, a minimum of 6 inches A.F.F. must be maintained for all boxes.
- C. Provide plywood backboard behind all surface panelboards and concrete housekeeping pads below surface panelboards to protect and enclose conduits extending up from floor.
- D. Panelboard circuit breaker numbering shall start at the top with odd numbered circuit breakers down the left side in sequence and even numbers down the right side.
- E. Wiring in panelboards shall be grouped in an orderly manner and secured with ty-wraps.
- F. No splices are allowed in panelboards. Panelboards shall not be used as junction boxes or wireways.
- G. Furnish and install a factory assembled switchboard as specified herein and as shown on the drawings.

31.03 TESTING

- A. Continuity tests and short circuit testing at 1KV shall be conducted on all panel, switchboard and feeder installations prior to closing breakers and applying power.

END OF SECTION 26 0100

SECTION 26 0150

FUSES

1.01 SUBMITTALS

- A. Shop drawings shall be submitted and shall consist of manufacturer's published literature and technical data sufficient for the engineer to determine whether system function will be adversely affected, whether proposed fuses meet this specification, and whether they are equal in quality.

1.02 MANUFACTURERS

- A. Acceptable manufacturers are:
1. Littelfuse
 2. Cefco
 3. Gould - Shawmut

1.03 EQUIPMENT/MATERIAL

- A. All fuses rated 600 volts or less and used for main, feeder, or branch circuit protection with 200,000 ampere interrupting rating and shall be so labeled. Fuse classes and sizes indicated on the drawings have been selected to provide a fully coordinated selective protection system. To maintain this design, all fuses provided shall be furnished by the same manufacturer. Should equipment provided require a different U.L. Class or fuse size, the engineer shall be furnished with sufficient data to ascertain that system function will not be adversely affected.
- B. Current-Limiting Fuses 601-6000 Amperes
- Fuses rated over 600 amperes shall be U.L. Class "L" fuses, and shall have a minimum time delay of 10 seconds at 500% rating.
- C. Current-Limiting Fuses 600 Amperes or Less
- All fuses 600 amperes and below shall be true dual-element time delay fuses with separate spring-loaded thermal overload elements in all ampere ratings. All ampere ratings shall be designed to open at 400 degrees Fahrenheit or less when subjected to a non-load oven test. To eliminate induction heating, all fuse ferrules and end caps shall be non-ferrous and shall be bronze or another alloy not subject to stress cracking.
- D. Spare Fuses
- At the time of final acceptance, the contractor shall furnish the owner's representative, not less than three (3) spare fuses of each size and type installed. Spare fuses at main switchgear are not required.

END OF SECTION 260150

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SECTION 26 0200

RACEWAYS

1.01 SUBMITTALS

- A. Submit manufacturer's literature for each type of conduit or tubing and fittings used in the project.

1.02 MANUFACTURERS

- A. Acceptable manufacturers of rigid steel and electrical metallic tubing conduit are:

1. Allied Tube and Conduit Co.
2. Wheatland Tube Co.
3. Triangle
4. L.T.V.
5. American Brass
6. E.T.P.
7. Robroy

- B. Acceptable manufacturer's of polyvinyl chloride (PVC) conduit are:

1. Certainteed
2. Georgia Pipe
3. Carlon
4. Can-Tex
5. Queen City

- C. Acceptable manufacturer's of conduit fittings, bushings, and locknuts are:

1. O-Z/Gedney
2. Thomas and Belts
3. Raco

1.03 MATERIALS

- A. All metallic conduit and electric metallic tubing shall be steel, of standard pipe dimensions, smooth inside and out, and shall be galvanized. Where the word "conduit" is used hereinafter it shall mean either rigid steel conduit, electric metallic tubing, flexible steel conduit, liquid tight flexible steel conduit or schedule 40 plastic conduit. Intermediate grade conduit is not acceptable.
- B. Galvanized rigid steel conduit shall be used in all areas where it will be exposed to physical damage. Schedule 40 plastic conduit shall be used underground and in slab-on-grade. In no case shall plastic conduit be above slab; switch to rigid steel conduit when turning up above slab (including elbow). All other conduit, unless otherwise specified or called for on the

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plans, may be galvanized electric metallic tubing. Any exposed conduit on exterior of the building shall be galvanized rigid steel.

- C. Plastic conduit shall be made from virgin polyvinyl chloride C-300 compound. Conduit and fittings shall carry a UL label. Fitting and cement shall be produced by the same manufacturer as the conduit to assure system integrity.
- D. All conduit shall be concealed in building construction except as noted or shown otherwise. In areas with no finished ceiling and where conduit is run exposed all runs down to switches, receptacles, etc. shall when possible be concealed in wall. It is the intent of these specifications that all conduit will be concealed whenever possible.
- E. EMT fittings shall be compression or tap-on type made of steel for sizes two inches or smaller, steel set screw type fittings may be used on sizes 2 1/2" or larger. Connectors and couplings shall be rain tight and shall have a nylon insulated throat. All fittings shall be "UL" approved. Die cast, and indenter type fittings are not acceptable. Fittings for flexible steel conduits and liquid tight flexible conduit shall be steel and have nylon insulated throat. All rigid steel conduit E.M.T. or flexible steel conduit 1" or over shall terminate using insulated grounding bushing similar and equal to O-Z/Gedney type BLG, bushings shall be steel, zinc coated with copper saddle.
- F. Rigid steel conduit and EMT shall be not less than ½ inch trade size, schedule 40 plastic conduit shall not be less than 3/4" trade size and not less than required by the NEC or indicated. However, where permitted by the NEC, smaller size flexible metal conduit may be used only for individual lighting fixtures. Conduit runs with more than 5 #12 conductors shall not be less than 3/4".
- G. Conduit and EMT systems indicated on the drawings for communication and signaling systems are for typical systems. Install conduit and EMT systems for the system being installed.
- H. Connect individual recessed lighting fixtures to the conduit or EMT system with "maximum 6'-0" flexible, galvanized steel conduit. Use liquid-tight flexible jacketed metal conduit for final connection to all rotating equipment and transformers. The flexible conduits shall be long enough to permit the full range of required movements without strain and to prevent the transmission of vibration. Do not utilize flexible conduit to loop between fixtures and devices. Length of flexible conduit shall be kept to a maximum of 4' or less.
- I. Galvanized rigid steel conduit couplings and connections:
 - 1. Install standard, conduit-threaded fittings.
 - 2. Ream the ends of conduits after cutting and threading them.
 - 3. For connection to sheet metal boxes, cabinets and other sheet metal enclosures, install locknuts on the inside and outside of the enclosure for each connection. See Section 16110 of these specifications.
- J. EMT couplings and connectors:
 - 1. Ream the ends of EMT after cutting them.

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2. Install the following threadless type fittings:
 - a. Connectors: steel compression type with insulated throat or steel tap-on type with insulated throat.
 - b. Couplings: steel compression or tap-on type.

- K. Installation of plastic conduit:
 1. Shall be installed in complete accordance with manufacturer's recommendations.
 2. Shall be a minimum of 2'-0" below finished grade when not covered by concrete.
 3. Shall have properly sized bond wire installed with all circuits.
 4. Bends and turns shall be kept to a bare minimum.
 5. Extreme care shall be taken to avoid crushing or cracking conduit. "DO NOT" run vehicles over exposed conduit under any conditions.
 6. All conduit and fittings shall be solvent welded.
 7. Do not install conduit in slab. All conduit shall be installed a minimum of 6" below slab. Conduits shall not be bunched together. Maintain 1" clearance between conduits.

- L. Insulated bushings:
 1. Install nylon insulated bushings on the end of all rigid conduit.
 2. The insulating material shall be designed for rugged, long service.
 3. Bushings which consist of only insulating material will not be accepted.
 4. Fittings which incorporate insulated bushings will be considered for approval in lieu of fittings with separate bushings.

- M. All couplings and connections in location where water or other liquid or vapor might contact the conduit and EMT shall also be watertight.

- N. Close empty conduit and EMT as complete runs before pulling in the cables and wires.

- O. Install exposed conduit and EMT parallel to or at right angles with the lines of the building. Locate them so they will not obstruct headroom or walkways or cause tripping.

- P. Avoid bends or offsets where practicable:
 1. Do not install more bends, offsets or equivalent in any conduit or EMT run than permitted by the NEC.
 2. Make bends with standard conduit bending machines.
 3. Conduit hickies may be used for making slight offsets and for straightening conduits tubbed out of concrete.
 4. Conduit or EMT bent with a pipe tee or vise will not be accepted.
 5. Do not install crushed or deformed conduits or EMT.

- Q. Install conduit or EMT clamps:
 1. At intervals as required by the NEC.
 2. Above suspended ceilings, metal supports may be installed as permitted by the NEC, except that conduit cannot be supported or secured to the T-bar grid or from the wire supporting the T-bar grid.

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3. Trapeze, split ring, band or clevis hanger may be installed as permitted by the NEC. Trapeze hangers shall be structural metal channels, angle irons or preformed metal channel shapes with the conduit and EMT runs held on specific center by U bolts, clips or clamps. Do not support conduit from ceiling suspension wire or from other conduit.
 4. Chain, wire or perforated strap supports will not be acceptable. Nor are they acceptable as a means of securing the conduit.
 5. Fasten the clamps and other supports as follows:
 - a. For new masonry or concrete structures, install threaded metal inserts prior to pouring the concrete.
 - b. For existing solid masonry or reinforced concrete structures:
 1. Install expansion anchors and bolts or approved power-set fasteners.
 2. Expansion anchors and bolts shall be not less than 1/4 inch diameter and shall extend not less than 3 inches into the concrete or masonry.
 3. Power-set fasteners shall be not less than 1/4-inch diameter and shall extend not less than 1-1/4-inch into the concrete.
 - c. For hollow masonry install toggle bolts. Bolts supported only by plaster will not be accepted.
 - d. For metal structures install machine screws.
 - e. Attachments to wood plug, rawl plug, soft metal insert or wood blocking will not be permitted.
- R. For vertical runs of conduit of EMT:
1. Install supports for conduit, EMT, cables and wires at intervals as required by the NEC and as indicated on the drawings.
 2. Conduit and EMT supports shall be supported by framing for the floors.
- S. Conduits and EMT shall be kept 6" away from parallel runs of steam or hot water pipes.
- T. Clogged raceways shall be entirely free of obstructions or shall be replaced.
- U. Rigid steel conduit installed underground and in concrete shall be coated with scotchrap pipe primer and then wrapped with two layers of scotchrap 50 and 51 corrosion protection tape.
- V. All empty conduit shall have nylon pull cord installed to provide for installation of cables, conductors or wiring.
- W. Do not combine conduit homeruns. Each homerun shall be separately routed directly to panel unless specifically noted otherwise.
- X. Rigid steel conduit installed underground and in concrete shall be coated with scotchrap pipe primer and then wrapped with two layers of scotchrap 50 and 51 corrosion protection tape (Bituminous paint, two layers, is acceptable).
- Y. All empty conduit shall have 200 lb. rated nylon pull cord installed to provide for installation of cables, conductors or wiring. Provide cap and label for each end identifying termination location of

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other end.

- Z. Do not combine conduit homeruns. Each homerun shall be separately routed directly to panel unless specifically noted otherwise.
 - AA. Cut clean and remove rough edges from all threads. Running threads are not acceptable. Rust inhibitive coating shall be applied to all exposed threads.
 - AB. All fire alarm systems branch circuits shall be provided in GRS, IMC, or EMT as locations required.
 - AC. At motor connections where GRS or IMC conduit cannot be attached to building within 18 inches of motor for liquid-tight flexible metal conduit transition, provide a minimum 3/4 inch vertical conduit attached to ceiling and floor from top and bottom of cast junction box. Locate cast junction box within 18 inches of motor and provide transition to liquid-tight flexible conduit with condulets.
 - AD. Provide expansion fittings at all expansion joints.
 - AE. Cap all conduits exposed during construction to prevent entrance of water or debris.
 - AF. Seal all conduits:
 - 4. Routed from interior to exterior of building.
 - 5. Routed from exterior to interior of refrigerated spaces.
- Fill conduit ends with duct seal at nearest conduit termination inside building or outside refrigerated spaces. Seal conduit inside refrigerated spaces with white Permagum.
- AG. In masonry walls, conduit shall not be routed horizontally. In wood or metal stud walls, conduit shall not be routed horizontally more than 1 foot. Exposed conduit shall be routed parallel or at right angles to building lines.
 - AH. No consolidation of homeruns is permitted.
 - AI. All conduits shall be routed clear of ductwork and piping.
 - AJ. Conduit runs shall be firmly anchored within 3 feet of any change in direction and at intervals not to exceed 8 feet. Straps and clamps designed specifically for the conduit system shall be used. (Nails are not acceptable.) Conduit may not be supported by piping, ductwork, ceiling grids, or ceiling grid hanger wire.
 - AK. Multiple parallel runs shall be supported by trapeze type assemblies constructed of all-thread support rods and unistrut with conduit clamps. Support rods shall not extend below trapeze more than 3/4 inch.
 - AL. See specification Section "Supporting Devices" in this electrical specification for anchors and support methods.

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- AM. Where conduits penetrate fire rated walls, ceilings, floors, or partitions, provide firestopping according to specification Section "Firestopping" in this electrical specification.

END OF SECTION 26 0200

SECTION 26 0300

CONDUCTORS

1.01 SUBMITTALS

- A. Shop drawings shall be submitted and shall consist of manufacturer's published literature.

1.02 MANUFACTURERS

- A. Acceptable manufacturers are:
- | | |
|-------------|----------------|
| 1. General | 6. Cyprus Rome |
| 2. Okonite | 7. Essex |
| 3. Senator | 8. Carol |
| 4. Triangle | 9. Southwire |
| 5. Pirelli | 10. American |
- B. All wiring shall be manufactured in the United States.

1.03 MATERIALS

- A. Ratings and sizes:
1. Shall be not less than indicated on the drawings and not less than required by the NEC.
 2. Minimum size shall be No. 12 AWG copper provided the maximum voltage drops in the control circuits will not adversely affect the operation of the controls.
 3. Conductor sizes indicated on the drawings are for copper conductors.
- B. Conductors and ground wires:
1. Shall be copper.
 2. Size No. 8 AWG and larger shall be stranded.
 3. Size No. 10 AWG and smaller shall be solid.
- C. Conductor insulation:
1. Conductor insulation shall be the NEC type THHN for sizes No 10 and smaller and XHHW for sizes No. 8 and larger. Under no circumstances shall asbestos insulation be used.
- D. Wire shall be factory color coded in size No. 10 and smaller. Color shall be by integral pigmentation with a separate color for each phase, neutral and grounding conductor. Color code per phase shall be continuous throughout the project.
- E. Manufacturer's name and other pertinent information shall be marked or molded clearly on the overall jacket's outside surface or incorporated on marker tapes within the cables and wires at reasonable intervals along the cables and wires.

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- F. Cables and wires indicated on the drawings for communication and signaling systems are for typical systems. Install cables and wires for the system being installed.
- G. All wiring shall be in conduit unless specifically noted otherwise.
- H. Every coil of wire shall be in the original wrapping and shall bear the Underwriters' Label of approval.
- I. Where wires are left for connection to any fixture or an apparatus, spare wire or cables shall be provided at the ends for connections. Fixture connections at the outlet box shall be made with insulated wire connectors.
- J. Outer jackets shall be color coded as follows:
 - 1. Three phase or single phase circuits, 120/208 volts:
 - a. Phase A - Black
 - b. Phase B - Red
 - c. Phase C - Blue
 - d. Neutral - White
 - e. Insulated ground wire - Green
 - f. Isolated ground wire - Green with Yellow tracer.
 - Note: Where dedicated neutrals are used for receptacle circuits. Outer jacket shall be white with appropriate colored tracer (i.e. white with red tracer, white with blue tracer, white with black tracer).
 - 2. Three phase or single phase circuits, 480/277 volts:
 - a. Phase A - Brown.
 - b. Phase B - Orange.
 - c. Phase C - Yellow.
 - d. Neutral - Gray.
 - e. Insulated ground wire - Green.
 - 3. Only for large power cables and wires which do not have color coded jackets: No. 8 and larger.
 - a. Install bands of adhesive non-fading colored tape or slip-on bands of colored plastic tubing over the cables and wires at their originating and terminations points and at all outlets of junction boxes.
 - b. Color shall be permanent and shall withstand cleanings.
- K. Wiring for signal circuits shall conform to the recommendations of manufacturers of the signal system being installed so the system shall have optimum performance and maximum service continuity. Communication and signaling circuit wiring where run in conduit below grade or in a damp location shall be listed for use in a damp or wet location. Communication

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and signaling circuits run exposed above ceiling in an environmental return air plenum area shall be rated for plenum use.

- L. No circuit wiring shall be smaller than number 12. Where the homerun exceeds 80'-0" in length, number 10 (minimum) wire shall be used even though all such circuits are not indicated on the plans. All wiring for emergency branch circuits shall be number 10 (minimum) unless noted otherwise.
- M. When installing THHN extra care must be exercised so as not to damage nylon jacket. When nylon jacket is damaged wiring shall be removed from service.

END OF SECTION 26 0300

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SECTION 26 0400

OUTLETS

1.01 SUBMITTALS

- A. Shop drawings shall be submitted and shall consist of manufacturer's published literature.

1.02 MANUFACTURERS

- A. Acceptable manufacturers are:
1. Raco
 2. Steel City
 3. Appleton
 4. Hubbell

1.03 MATERIALS

- A. Boxes shall be galvanized pressed sheet steel for all concealed work.
- B. Where conduit runs are exposed, outlet shall be of the cast metal type.
- C. For concealed work each box shall be provided with a square cornered plaster ring.
- D. 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. 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.
- E. 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.
- F. In addition to boxes indicated, install enough boxes to prevent damage to cables and wires during pulling-in operations.
- G. 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.
- H. "There shall be no outlets installed back to back. A minimum of 4" shall separate each outlet."

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- I. 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.
- J. Outlet boxes shall be clean and free from dust, paint, dirt, plaster ready mix joint compound and /or any other debris.

END OF SECTION 26 0400

SECTION 26 0700

DISCONNECT SWITCHES

1.01 SUBMITTALS

- A. Shop drawings shall be submitted and shall consist of manufacturer's published literature.

1.02 MANUFACTURERS

- A. Acceptable manufacturers are:
 - 1. Square "D" Company
 - 2. G. E.
 - 3. I.T.E.
 - 4. Cutler Hammer

1.03 EQUIPMENT

- A. Disconnect switches shall be provided for all motors and strip heaters located out of sight of motor controller, and where specifically indicated on the drawings. Disconnect switches shall disconnect all ungrounded conductors. When exposed to weather, enclosure shall be NEMA - 3R. Switches shall be installed to be fully accessible in accordance with Article 110-16 of the National Electrical Code.
- B. All disconnects shall be heavy duty type and shall be equipped with neutral bar bonded to the can for grounding purposes.
- C. For single phase motors, a single - or double-pole toggle switch, rated only for alternating current, will be acceptable for capacities less than 30 amperes, provided the ampere rating of the switch is at least 125 percent of the motor rating. Enclosed safety switches shall be horsepower rated in conformance with Table III of Fed. Spec. W-D-865. Switches shall disconnect all ungrounded conductors.
- D. Each disconnect serving exterior A/C units shall be equipped with a padlock (Master 3206) all keyed alike.
- E. All disconnects shall be equipped with provisions to lock the handle in the OFF position.
- F. All disconnects serving heat pumps, A/C units and refrigeration compressors shall be fused in accordance with the name plate data on the unit.
- G. Install fuses so that ampere rating can be read without having to remove fuses.
- H. All fuses shall be as noted in Section 26 0150.
- I. Disconnects shall be identified as required under Section 26 0000.

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- J. Maintain 3'-0" clearance in front of disconnect having voltage rating of 250 volts and 4'-0" clearance in front of disconnect having voltage rating of 480 volts. Do not locate disconnect over other electrical equipment (re: transformers).

END OF SECTION 26 0700

SECTION 26 1000

PULL BOXES AND JUNCTION BOXES AND FITTINGS

1.01 PULL BOXES AND JUNCTION BOXES AND FITTINGS

- A. Boxes shall be provided in the raceway systems wherever required for the pulling of wires and the making of connections.
- B. Pull boxes of not less than the minimum size required by the National Electrical Code Article 370 shall be constructed of code-gauge galvanized sheet steel. Boxes shall be furnished with screw-fastened covers. Covers on flush wall mounted boxes in well appointed areas (offices, reception, classrooms, media center, etc) shall be minimum 1/16 302 stainless steel. Boxes located on the exterior of the building shall be watertight. Covers shall be secured with tamper proof screws.
- C. Boxes shall be securely and rigidly fastened to the surface of which they are mounted or shall be supported from structural member of the building either directly or by using a substantial and approved metal rod or brace.
- D. All boxes shall be so installed that the wiring contained in them can be rendered accessible without removing part of the building.
- E. Where several circuits pass through a common pull box, the circuits shall be tagged to indicate clearly their electrical characteristics, circuit number and designation.

END OF SECTION 26 1000

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SECTION 26 1100

GROUNDING

PART 1 GENERAL:

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. The work required under this section of the specifications consists of furnishing, installation and connections of the building secondary grounding systems. Exterior branch circuit wiring and feeder conductors extended beyond the building are included. The building electrical system shall be a 3 phase, 4 wire grounded wye delta system supplemented with equipment grounding system. Equipment grounding system shall be established with equipment grounding conductors; the use of metallic raceways for equipment grounding is not acceptable.

1.03 QUALITY ASSURANCE

- A. Industry Referenced Standards: The following specifications and standards are incorporated into and become a part of this Specification by Reference.
 - 1. Underwriters' Laboratories, Inc. (UL) Publications:
 - No.44 Rubber-Insulated Wire & Cables
 - No.83 Thermoplastic-Insulated Wires
 - No.467 Electrical Grounding & Bonding Equipment
 - No.493 Thermoplastic-Insulated Underground Feeder & Branch Circuit Cables
 - No.486 Wire Connectors and Soldering Lugs
 - 2. National Electrical Manufacturers' Standards (NEMA):
 - WC-5 Thermoplastic Insulated Wire & Cable
 - WC-7 Cross-Linked-Thermosetting Polyethylene Insulated Wire
 - 3. National Fire Protection Association Publication (NFPA):
 - No.70 National Electrical Code (NEC)
 - No.76B Safe Use of Electricity in Patient Care Areas of Hospitals
 - No.99 Health Care Facilities
- B. Acceptable Manufacturers: Products produced by the following manufacturer which conform to this specification are acceptable.
 - 1. Hydraulically applied conductor terminations:

- a. Square D
 - b. Burndy
 - c. IlSCO
 - d. Scotch (3M)
 - e. Thomas and Betts (T&B)
 - f. Anderson
2. Mechanically applied (crimp) conductor terminations:
- a. Scotch (3M)
 - b. Ideal
 - c. Thomas and Betts (T&B)
 - d. Burndy

PART 2 PRODUCTS:

2.01 GENERAL MATERIALS REQUIREMENTS

- A. Provide all materials under this section of the specifications. All materials shall be new.
- B. All materials shall be UL listed and bear a UL label.
- C. Refer to the specific specification section for the description and requirements of materials mentioned herein for installation.

2.02 GROUNDING CONDUCTORS

- A. Grounding electrode conductor shall be bare or green insulated copper conductor sized as indicated on the drawings.
- B. Equipment grounding conductors shall be green insulated type THHW, XHHW conductors sized as indicated on the drawings. Where size is not indicated on the drawings, conductor size shall be determined from the National Electrical Code table of sizes of equipment grounding conductors.
- C. Bonding jumpers shall be flexible copper bonding jumpers sized in accordance with the National Electrical Code table on sizes of equipment grounding electrode conductors.

2.03 TRANSFORMERS & MOTOR CONTROLLERS

- A. Provide a conductor termination grounding lug bonded to the enclosure of each transformer and motor controller.
- B. Provide a neutral bar with bonding screw in each disconnect for grounding purposes.

2.04 DEVICES

- A. Each receptacle and switch device shall be furnished with a grounding screw connected to the metallic device frame. Bond equipment grounding conductor to each outlet box. For

isolated ground receptacles, bond equipment grounding conductor to box, and isolated ground conductor to device grounding screw.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Ground all non-current carrying parts of the electrical system, i.e., wireways, equipment enclosures and frames, junction and outlet boxes, machine frames and other conductive items in close proximity with electrical circuits, to provide a low impedance path for potential grounded faults.
- B. Equipment Grounding Conductor
 - 1. Grounding conductors shall be provided in all branch circuit raceways and cables. Grounding conductors shall be the same AWG size as branch circuit conductors.
 - 2. Grounding conductors for feeders are typically indicated on the drawings and the raceway is sized to accommodate grounding conductor shown. Where grounding conductor size is not indicated on the drawings, conductor shall be in accordance with the equipment grounding conductor table of the National Electrical Code.
 - 3. A grounding conductor shall be installed in all flexible conduit installations. For branch circuits, grounding conductor shall be sized to match branch circuit conductors.
 - 4. A feeder serving several panelboards shall have a continuous grounding conductor which shall be connected to each related cabinet grounding bar.
 - 5. The equipment grounding conductor shall be attached to equipment with bolt or sheet metal screw used for no other purpose. Where grounding conductor is stranded, attachment shall be made with lug attached to grounding conductor with crimping tools.
 - 6. Ground all motors by drilling and tapping the bottom of the motor junction box with a round head bolt used for no other purpose. Conductor attachment shall be through the use of a lug attached to conductor with a crimping tool.
 - 7. Equipment grounding conductors shall terminate on panelboard, switchboard, or motor control center grounding bus only. Do not terminate on neutral bus. Provide a single terminal lug for each conductor. Conductor shall terminate the same section as the phase conductors originate. Do not terminate neutral conductors on the ground bus.

3.02 TESTING

- A. Upon completion of the ground rod installation, grounding resistance reading shall be taken before connection is made to the building cold water piping system. Ground resistance readings shall not be taken within forty-eight hours of rainfall. Results of ground resistance readings shall be forwarded, in writing, immediately to the Architect and Owner.

END OF SECTION 26 1100

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SECTION 26 1200

EQUIPMENT IDENTIFICATION

1.01 SUBMITTALS

- A. Submit sample of laminated plastic identification plate with lettering.

1.02 MATERIALS

- A. Laminated plastic plates with 3/16" high white letter etched on black background.
- B. Plates shall be permanently mounted utilizing pop rivets.
- C. Painted, stenciled or indented tape identification is not acceptable.

1.03 ITEM IDENTIFICATION

- A. All electrical apparatus such as wiring troughs, panelboards, individual circuit breakers, transformers and disconnect switches shall have laminated plastic identification plates. Identification shall match labeling shown on plans.
- B. A "steel" circuit directory frame, and a directory card with a plastic covering shall be provided on the inside of each panel door. The directory shall be typed to identify the load fed by each circuit and the areas served. Spaces or room numbers shown on the drawings are not necessarily the final numbers to be assigned to these areas. The Contractors shall before completion of the project obtain from the Architect final space or room numbers so that it can be typed onto directory.
- C. Circuit breakers and disconnects shall identify the equipment served and circuit and panel from which it is served.
- D. On all panelboards the exterior identification plate shall match that on the drawings and the panel and circuit number serving the panel shall be designated within the panel.

END OF SECTION 26 1200

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SECTION 26 1750

FIRESTOPPING

1.01 RELATED DOCUMENTS

- A. The requirements of the general conditions, supplementary conditions, and division 1, general requirements, apply to Work in this Section.
- B. Coordinate work of this Section with the work of the following Sections to properly execute the work in the order to maintain the hourly ratings of the walls and floors where firestopping and smoke seals are applied.
 - 1. Section - Concrete Work
 - 2. Section - Masonry Work
 - 3. Section - Smoke Seals
 - 4. Section - Joint Sealers
 - 5. Section - Dry Wall
 - 6. Division 26 0000 Section - Electrical Work

1.02 DESCRIPTION

- A. This Section describes the requirements for furnishing and installing firestopping for fire-rated construction. This includes:
 - 1. All openings in fire-rated floors and wall assemblies, both blank (empty) and those accommodating penetrating items such as cables, conduits, etc.

1.03 REFERENCES

- A. ASTM E 814: "Standard Method of Fire Tests of Through-Penetration Firestops"
- B. UL 1479, UBC 7-5: (both are same as A above)
- C. ASTM E 119: "Standard Method of Fire Tests of Building Construction and Materials"
- D. UL263, UBC 7-1: (both are same as C above)
- E. UL 2079: "Standard for Tests for the Fire Resistance of Building Joint Systems"
- F. Published Through-Penetration Systems by recognized independent testing agencies.
 - 1. UL Fire Resistance Directory.
 - 2. Warnock Hersey Certification Listings, current year.

1.04 QUALITY ASSURANCE

- A. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM 814, UL 1479 or UL 2079. The F rating must be a minimum of one (1) hour but not less than the fire

resistance rating of the assembly being penetrated. T rating, when required by code authority, shall be based on the measurement of the temperature rise on the penetrating item(s). The fire test pressure differential of a minimum 0.01 inches of water column is required.

- B. Fire stopping products shall be asbestos free, free of any PCBs and free of any lead.
- C. Do not use any product containing solvents, or that require hazardous waste disposal.

1.05 SUBMITTALS

- A. Submit manufacturer's product literature for each type of Firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance, limitation criteria and test data.
- B. Submit manufacturer's Warranty.
- C. Material Safety Data Sheets: Submit MSDS for each firestop product.
- D. Shop Drawings: Show typical installation details for methods of installation. Indicate which firestop materials will be used where and thickness for different hourly ratings.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in the manufacturers' original, unopened containers or packages with manufacturers' name, product identification, lot number, UL or Warnock Hersey labels, and mixing and installation instructions, as applicable.
- B. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturer.
- C. All firestop materials shall be installed prior to expiration of shelf life.

1.07 PROJECT CONDITIONS

- A. Verify existing conditions and substrates before starting work.
- B. Do not use materials that are based on organic solvents.
- C. During installation, provide masking and drop cloths to prevent firestopping products from contaminating any adjacent surfaces.
- D. Conform to ventilation requirements by manufacturer's installation instructions or Material Safety Data Sheet.
- E. Weather Conditions: Do not proceed with installation of firestop products when temperatures are in excess of or below the manufacturer's recommendations.
- F. Schedule installation of firestop products after completion of penetration item installation but prior to covering or concealing of openings.

- G. Coordinate this work with work of other trades.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide products of one of the following manufacturers as shown below and further defined by the materials listed in Part 2.02 of this section.
1. The RectorSeal Corporation. Products as listed are a standard of generic types.
 2. International Protective Coatings
 3. 3M Company
 4. Hilti

2.02 MATERIALS

- A. Firestop Mortars:
1. Metacaulk Fire Rated Mortar by The RectorSeal Corporation
 2. KBS Mortar by International Protective Coatings
- B. Firestop Sealants and Caulks:
1. Metacaulk 950 by The RectorSeal Corporation
 2. Metacaulk 835 by The RectorSeal Corporation
 3. Metacaulk 805 by The RectorSeal Corporation
 4. Metacaulk 1000 by The RectorSeal Corporation
 5. CP 25WB+Caulk by 3M
 6. Flame-Safe FS900 Series by International Protective Coatings.
- C. Firestop Putty:
1. Metacaulk Fire Rated Putty by The RectorSeal Corporation
 2. Metacaulk Fire Rated Putty pads by The RectorSeal Corporation
 3. MPS-2 Moldable Putty Stix by 3M
 4. MPP-4S Moldable Putty Pads by 3M
- D. Firestop Sleeves:
1. Metacaulk Pipe Collars by The RectorSeal Corporation
 2. Plastic Pipe Devices by 3M
 3. Plastic Pipe Collars by International Protective Coatings
- E. Intumescent Wrap Strips:
1. Metacaulk Wrap Strip by The RectorSeal Corporation
 2. FS-195 Wrap Strip by 3M
 3. Wrap Strip by International Protective Coatings
- F. Firestop Mastic:
1. Metacaulk 1100 by The RectorSeal Corporation
 2. Firestop Mastic by 3M.
 3. Firestop Mastic by International Protective Coatings
- G. Accessories:

1. Forming/Damming Materials: Mineral Fiberboard or other type recommended by manufacturer.
 2. Primer, sealant and solvent cleaner: As recommended by firestop manufacturer.
- H. Where subject to movement, firestop products used shall remain flexible to allow for such normal movement of building structure and penetrating item(s) without affecting the integrity of the firestop system.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine the areas and conditions where firestops are to be installed and notify the Architect of conditions detrimental to proper and timely completion of the work.
- B. Verify the penetrating item(s) are permanently installed and construction of fire rated assemblies are completed prior to firestop installation.
- C. Prior to installation of firestop systems, clean surfaces of penetrating item(s) that will be in contact with firestop materials. Do not use any cleaning material that will either attack penetrating item(s) or firestop product to be installed.

3.02 CONDITIONS REQUIRING FIRESTOPPING

- A. General:
 1. Provide fire stopping for conditions specified whether or not firestopping is indicated, and, if indicated, whether such material is designated as insulation, safing or otherwise.
 2. Insulation types specified in other Sections shall not be installed in lieu of firestopping material specified herein.
- B. Penetrations:
 1. Penetrations include conduit, cable, wire, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.
 2. Except for floors on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide firestopping to fill such spaces in accordance with ASTM E 814 (UL 1479).
 3. These requirements for penetrations shall apply whether or not sleeves have been provided. Firestop the annular space between sleeve and surrounding surfaces.
- C. Provide firestopping to fill miscellaneous voids and openings in fire rated construction in a manner essentially the same as specified herein before.

3.03 INSTALLATION

- A. Regulatory requirements: Install firestop products in accordance with fire rated test assemblies as published by either UL or Warnock Hersey or accordance with manufacturer engineer drawings.
- B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of

through-penetration firestop systems.

1. Firestop all holes or voids made in fire resistive assemblies, made by penetrations, to ensure against the passage of flames, smoke, and toxic gases.
2. Protect materials from damage on surface subjected to traffic and install cover plate as required on any installed firestop system that will or may be subject to traffic.
3. Tool surfaces of firestop products to provide a smooth and clean appearance.

3.04 FIELD QUALITY CONTROL

- A. Follow safety procedures recommended in Material Safety Data Sheets.
- B. Examine penetration firestopped areas to ensure proper installation before concealing or enclosing areas.
- C. Keep areas of work accessible until inspection by Architect.

3.05 ADJUSTING AND CLEANING

- A. Remove equipment, materials and debris, leaving areas in undamaged and clean conditions.
- B. Neatly cut and trim materials.

END OF SECTION 26 1750

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SECTION 26 2200

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.
- 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.

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 panels have breakers as specified, ground bar, copper bus, typed directory for circuit identification and that they are free of trash.
 - 2. Demonstrate that all conduits are supported as required by the National Electrical Code.
 - 3. Demonstrate that all outlet boxes above or on the ceiling are supported as required by the National Electrical Code.
 - 4. 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".
 - 5. Demonstrate that outlet boxes in wall are secure.
 - 6. Demonstrate that all devices are properly secured to boxes, that device plates are properly aligned and are not being used to secure device.
 - 7. Utilizing a Woodhead No. 1750 testing device, demonstrate that all 125 volt receptacles are properly connected.
 - 8. Demonstrate that all disconnects requiring fuses are fused with the proper size and type, and that all disconnects are properly identified.

END OF SECTION 26 2200

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